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AFIT/GIR/LSM/90D-6

AIR FORCE INFORMATION MANAGEMENT (IM): A 1990 SNAPSHOT AND 1995 FUTURE LOOK AT AIR FORCE IM NEEDS AND PREFERRED EDUCATION/TRAINING APPROACHES

THESIS

Richard T. McGhee, III
Captain, USAF

AFIT/GIR/LSM/90D-6

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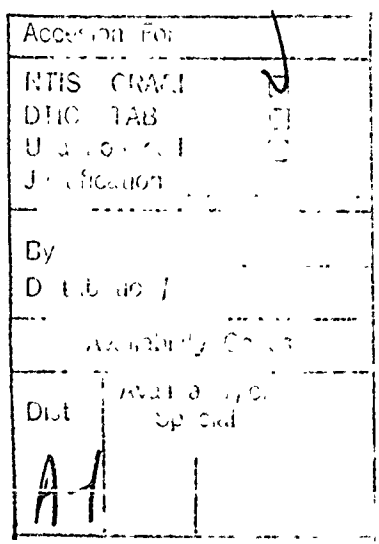

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AIR FORCE INFORMATION MANAGEMENT (IM): A 1990 SNAPSHOT AND 1995 FUTURE LOOK AT AIR FORCE IM NEEDS AND PREFERRED EDUCATION/TRAINING APPROACHES

THESIS

Presented to the Faculty of the School of Systems and Logistics of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the Requirements for the Degree of
Master of Science in Information Resource Management

Richard T. McGhee, B.S.
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December 1990

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Preface

The goal of this research was to focus attention on the mission of Information Management--a career field undergoing extensive functional change. Changes, which in my opinion, challenge the career field's basic mission and structure.

There was once a time when a commander needed only to hand his instructions to a fleet-footed soldier to get information to his troops. Armed with the knowledge of his destination, the messenger required little more than a fast horse and keen equestrian skills. Today, however, messages are created on keyboards and transported at near the speed of light. Today...we find that movement of information demands less of the physical man and more of the mental.

In conducting this research, I discovered extraordinary cooperation and commitment among and between its participants and contributors. I am indebted to each one for a number of reasons. The twenty-four IRM graduates I interviewed gave numerous hours of their time. Major Jake Simons and Lt Colonel Phillip Miller channeled my unharnessed enthusiasm into a researchable topic. My God, parents, Mom Moody, classmates, and their families held me up under the gravest of circumstances. Melinda was patient, allowed me to be "icky", and reminded me often that I could complete this project. Finally, I must pass a word of thanks to Major (Ret.) Robert McGhee for starting me on the path of a great Air Force life. Thanks UB.

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Abstract

This research investigated 37 training topics which were of interest to Air Force (AF) information managers, Air Force Specialty Code 70XX. The topics were grouped into the following seven information resource related clusters: (1) computer operating systems, (2) data communications, (3) Air Force Standard Systems (PDOS, RAMS, RIMS, and PCIII), (4) information resource management concepts, (5) AF/IM career field issues, (6) computer hardware, and finally, (7) computer software. Twenty-four graduates of the AF Institute of Technology's (AFIT) Information Resource Management program were asked to provide their perceptions of AF information managers (IMs) current (1990) and needed (1995) knowledge/skill levels on each topic. Telephone interviews with the respondents indicated that, relative to the 37 topics discussed, the graduates perceived a significant difference between current and needed knowledge/skill levels in practically all topic areas. The respondents also provided recommendations on effective and practical training methods/approaches for closing knowledge/skill level gaps. Finally, the graduates provided feedback relative to the effectiveness of the IRM program.

AIR FORCE INFORMATION MANAGEMENT (IM): A 1990 SNAPSHOT AND 1995 FUTURE LOOK AT AIR FORCE IM NEEDS AND PREFERRED EDUCATION/TRAINING APPROACHES

I. Introduction

"In a modern state, the only 'offices' for which no technical qualifications are required are those of ministers and presidents" (45:169). Max Weber--19th Century

General Issue

Even before 1900, Max Weber's research in the area of organizational performance had recognized a need for technical expertise in efficiently operating organizations (45:167).

Over the past ten years the Air Force career field of information management (IM), formerly administration (DA), has undergone numerous technological transformations (2:1; 8:1; 17; 33; 38; 43:1; 46; 54; 60; 71; 72:1). Current Air Force-wide implementation of the Records Information Management System (RIMS), is a model example. According to project manager, Captain Bobby Crow, RIMS automates:

> ...most of the labor intensive and time consuming tasks of Base Level Records Managers (BLRM). It prints file plans, records disposition labels, and file folder labels. It tracks requests for information under the Freedom of Information Act (FOIA) by monitoring suspenses, denial, or release of information, and associated costs and collection of funds. Further, it

> consolidates and prints [BLRM] required reports. It gives the BLRM required information on records custodians and outputs management reports. (11)

RIMS has a direct impact on IMs and all other Air Force members who create or maintain written documentation (electronic or paper) because they must learn to use this new computerized system. Another example of technological change is the SARAH system, Standard Automated Remote to AUTODIN, which eliminates the need to prepare messages, DD Forms 173, on paper (43:1). Instead, floppy disks are used to capture and transmit information. Sergeant Patrick Goldsmith, noncommissioned officer in charge of the Langley AFB VA project commented:

> To some, "reusable media" may not seem like a fresh idea in communications, but consider preparing all your messages on floppy disks and never again having to worry about aligning, typing [by communications work center personnel], correcting, and possibly retyping a DD Form 173. ...the message will be entered into the AUTODIN directly from your diskette. (43:1)

Also new to the IM community is PDOS, the Publications Distribution Ordering system. Using desktop computers and Air Force developed software, IM publication managers throughout the AF have been empowered with the tools to automate virtually all publications management and ordering processes (53; 60).

In addition to the computer-based systems which are now in operation, new initiatives, manifesting even greater potential IM impact, are planned and programmed. Each one is deeply linked to computers and network technology.

Project Officer for the 50-S Program, Major Carl Vercio, SAF/AADP/AV describes its impact on IM in three ways:

> The 50-S Program provides (1) Use of state of the art electronic publishing equipment; (2) Creation of the first AF/IM digital (electronic) publishing database; (3) Electronic publishing for about the same money we were spending to conventionally typeset the same departmental publications and forms. (74)

The 50-S initiative is augmented by another major technological challenge for IMs--Information Management Network (IM-NET) (52). IM-Net is designed to provide IMs the data communications network tools to receive, store, print, distribute, and manage electronic publications and forms throughout the AF. This service is planned to ultimately provide users with "online" publications and forms (52). Such capabilities are recognized sources of monumental functional changes which will significantly impact the operation of IM publishing, reproduction, records management, administrative communications, and supported base agencies (52; 72:1-2). Also on the IM horizon, is Air Force Message Service (AFMS). AFMS is slated to replace traditional AF message centers and enable message senders to route messages directly to the intended reader's terminal over the Defense Data Network (DDN) (38).

Finally, the impact of technological changes originating in other organizations must be considered. The most prominent relative to IM, is Personnel Concept III (PC III). PC III is designed, "...to provide commanders and orderly rooms access to the existing Personnel Data System

(PDS)" (50). By utilization of distributed database access, IM strategic planners predict that Personnel Concept III (PC III) will, "eliminate 43 forms which are currently used at eight to nine million copies per year" (33: 72:1).

Each of these projects and initiatives offer major changes and challenges to the IM career field. However, in spite of these technological changes, little change has taken place with respect to information management's basic mission--managing and moving information--or the training and education IM's receive (18; 19; 20). Instead, the changes of the 1980s arose in the methods and tools used to accomplish IM's mission. The researcher posits that it is these changes which have plunged IM deeply into what Gordon B. Davis defines as "knowledge-based" work:

> The definition of knowledge work is not precise. The term contrasts with manual work, physical production work, or physical service work...knowledge work involves thinking, processing information, and formulating analysis, recommendations, and procedures... Knowledge work is a relative concept with respect to jobs. There are knowledge work components in many tasks, and probably no jobs are composed of only knowledge work or lack knowledge work. (15:409)

Historically, the job of information managers (IMs) has been primarily physically oriented (18:5; 72:3). In the words of 25 year information manager Master Sergeant Douglas Porter, "IM was feet and fingers business" (18:5; 60). Typical duties of "administrators" included: managing and using typewriters, filing documents, completing publication

order forms, proof-reading paperwork, mailing documents, and hand-delivering information (18:5; 60; 69:3).

Today, IMs operate in a much different environment (53; 60; 72:3). Today, the realm of IMs spans office automation, electronic mail, local area networks (LANs)/wide area networks (WANs), decision support systems (DSS), optical disk storage/retrieval systems, personal/mini/mainframe computers, software management/development applications, and numerous other information resource management technologies (20; 21; 43; 52; 72). Each of these areas presents new opportunities and challenges to a career field once characterized by its abundance of mundane tasks. According to Colonel Edward Pardini, USAF Director of Information Management, and Volume I of the USAF IM Strategic Plan, " ...IM will move away from the laborious chores of creating and editing written guidance, processes, and procedures" (72:3).

The future does not appear mundane. Air Force IMs now find themselves struggling to learn the new ways of their more technical environment (8:74-75+86; 54). In 1988, Coleman's (8) research formally began the recognition of that struggle:

> More than one-half of the [respondents'] comments were concerned with the lack of computer training available. One respondent commented that "understanding computers is essential to all we [information managers] do and computer skills courses must be mandatory in technical training school programs and all graduate programs such as AFIT." ...respondents commented they have received computer equipment and soft-

> ware applications, but have been unable to receive even a limited amount of training to put the equipment to use. (8:75)

An anonymous recent interview (1990) with one field level IM officer reflected a similar, but more frustrated sentiment:

> Sure my guys could do our job better with more computers and software; we are desperate! Right now I'd order anything I could get my hands on--even a Z-100 [Zenith 100 computer]! We'd learn to use it anyway we could!

The comments provided by these information managers reflect a desire to improve the service to IM's customers; however, such comments might also provide an ominous danger signal to the IM professional. One might ask, "What are the IRM needs of the career field, or what degree of satisficing is prudent?" Should IMs buy and use "whatever is available" now?

While it may be argued that the above examples are isolated cases, there is evidence to support and amplify the contrary. For instance, Hartnett (35) reported two documented problems with the above described "buy what is available now" approach:

> First, rapid acquisition without proper planning has often rendered some systems ineffective. This occurs when an organization jumps on the computer bandwagon, buying whatever computer system is the most popular at the time. Upper-management often feels that the mere presence of the high-tech machines will increase productivity. However, when the need for a new system is not definitized, the purpose and proper use usually remain unclear. ...second problem is that improper planning often results in passive acceptance of the new system by the intended users.... (35:3)

In summary, the career field of information management is faced with a large scale information resource management problem. Air Force regulations designate IM as the agency responsible for managing all administrative information management systems. However, a majority of the people who perform the management duties, believe they are ill-prepared, for the mission assigned. There is evidence to support that IMs believe there is a void between what information managers do know and what they need to know about management information systems (MIS) (8:28). Such systems have become a professional concern for many Air Force information managers.

Management Information Systems

Academically, the MIS field represents a combination of four major areas: managerial accounting, operations research, management and organizational theory, and computer science (15:13+22;). Although no single definition of MIS is universally accepted, Davis (15) presents a widely used description:

> An integrated, user-machine system for providing information to support operations, management, analysis and decision making functions in an organization. The system utilizes computer hardware and software; manual procedures; models for analysis, planning, control and decision making; and a database (15:6).

Davis's description expresses the diversity of a multi-disciplined profession of significant interest to the Air Force. The AF has designated Information Management (IM) as

the office of primary responsibility for non-command and control MIS issues.

For clarification, it should be recognized that the term "management information systems (MIS)" is often used interchangeably with "Information Resource Management (IRM) and Administrative Information Systems (AIS). Some authorities define IRM as encompassing a broader range of resources, AIS covering the narrowest area, and MIS falling somewhere between the two (15:7). However, for the purposes of this research, MIS and AIS are treated equally.

Advances in MIS technology have greatly expanded the scope of computer applications. Original users were restricted to a few highly specialized scientists operating in even fewer commonly known locations (10:51-78). However, in 1981, the public release of IBM's desktop microcomputer made possible the introduction of small powerful computers to businesses and homes on an international scale (29:74). Relatively low cost, high computing power, and ease of operation were key characteristics, which in a short period of time, brought computers to the desktops of thousands of Air Force members in virtually all types of organizations (50).

Specific Problem

While little about the objectives of IM's mission has changed, much has changed about the ways in which the mission is performed. In large part, today's AF IM professional has been inundated with powerful new technologies which were rapidly introduced and inserted into a career field whose members were untrained for the technology's use. Harmon's surveys of three levels of IMs, MAJCOM IM, base Chief IM, and enlisted RAMS, RIMS, and PDOS users indicated that slightly more than 34 percent rated their respective training as fair or poor (34). In fact, respondents indicated that much of their training was conducted by costly trial and error testing. Consequently, this research explores two strongly related problems. The first problem is to identify what IMs need to know about Air Force information resource technology. The second is to identify practical methods and approaches for bringing that knowledge to those whose job is to manage, maintain, and operate it.

Research Objective

The primary objective of this research is to document training-related recommendations of the Air Force's best information resource management experts. As defined by the former USAF Director of Information Management, Colonel William O. Nations, those experts are the graduates of the

Air Force Institute of Technology's Information Resource Management (IRM) program (53).

The researcher's objectives were to collect the IRM graduates' recommendations, analyze their responses, and ultimately make available a baseline list of needed skills and augmentative teaching/training methods which could be practically implemented in the field.

Investigative Questions

To support the research objective the following four questions are presented:

1. To what extent are USAF information managers knowledgeable of various information resource technologies and techniques?
2. To what extent should USAF information managers be knowledgeable of relevant information resource technologies and techniques?
3. What are the most practical methods for teaching/training needed skills to information managers?
4. How do IRM graduates perceive the effectiveness of the AFIT IRM program in providing needed IM officer skills?

Assumptions

The first assumption was that the graduates had associated with sufficient numbers of non-graduate IM officer and enlisted personnel to have formed perceptions about the extent of their knowledge relative to IM and

information resource management. Information was gathered in the survey to help support this assumption.

The second assumption was that the graduates were sufficiently aware of the projected, planned, and programmed AF information systems and related technologies to discern needed areas and levels of expertise. This seemed a reasonable assumption since eighteen of the twenty-four graduates were serving either at headquarters level or specialized IRM related development centers where initiatives generally originate.

The third assumption was that the graduates would provide their honest perceptions and recommendations relative to the questions asked. Feedback obtained during the interviews supported the prior expectation that there was virtually no reason to assume otherwise.

Scope

This research was directed solely to the collection of comments provided by the 24 AFIT Information Resource Manager graduates. Interviews were requested with all IM graduates. No limitations on duty location, or job uniqueness, were imposed.

Relative to the number of AF information managers the number of IRM graduates is diminutively small. From a population of approximately 2400 IM officers and slightly over 20,000 enlisted members, 24 IM officers have been awarded the IRM degree. Although small in number, the

graduates are regarded by IM's senior leadership as the career field's recognized experts in the area of information resource management (53; 33). Such high regard and proven credibility, according to Colonels Nations and Halsworth, is linked to the graduates successful performance in the field and the Air Force Institute of Technology's (AFIT) reputation for rigorous academic training and education (54, 33). AFIT's credibility is nationally recognized:

> The Institute is institutionally accredited through the doctoral degree level by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools. (23:1)

IRM Curriculum

The IRM curriculum consists of 78 quarter hours of graduate level information resource management course work, presented during an 18 month in-residence program (3:175). As stated in the AFIT catalog:

> The curriculum consists of 24 core, specialty and elective courses, plus 12 quarter-hours of thesis research and study. The core courses provide a wide variety of quantitative and qualitative information common to graduate management programs. The GIR [IRM] specialty courses focus on the material concerned with the successful introduction and utilization of information technology in AF organizations. (3:176)

The primary focus of instruction is designed to teach students state of the art principles and concepts of information management while establishing a complementary technical foundation. A key goal of the program is to enable the graduate to intelligently represent and integrate the needs of MIS users, designers, and builders (3:176; 73).

Specific course work includes data communications/networks, database management, systems analysis/design, decision support systems, and organizational behavior/development. A complete listing of the curriculum is provided at Appendix A.

New IM Research

The range of this research extends beyond [illegible] "snapshot" view of IM officers described by Coleman (8:6). Her research rendered a description of the extent of knowledge IM officers possessed relative to information technology in general, rather than information technology and techniques specific to the IM career field. It is on this point that the author's and Coleman's (8) research diverge, and fundamental differences in research objectives are presented. Coleman (8) developed her instrument based primarily on the recommendations of Nunamaker (57) and Ashenhurst (4) as appropriate for graduate and undergraduate students specializing in the study of information systems. As a result, her findings reflected the extent of IM officers' knowledge in comparison with the recommended knowledge level for undergraduate and graduate students studying management information systems. In contrast, the knowledge addressed by this research compares the extent of IMs knowledge with respect to operational areas of IM's mission. In total, three new dimensions of IM research are presented here which Coleman (8) did not investigate:

(1) identification of specific AF IM needs, 2) recommendations of practical implementation methods/approaches to meet the needs, and 3) IRM graduate appraisals relative to the effectiveness of the AFIT IRM program.

Limitations

The first limitation was that the study was restricted to one select group--IM officers possessing AFIT IRM graduate degrees. Therefore the results may not be representative of the career field as a whole. However, the preceding discussion indicates the perceived relevance of this group's perspective.

The second limitation was that the IM career field structure is quite different in comparison with other Air Force careers. Approximately 85% of all IMs perform their jobs in organizations outside IM organizations (53). The remaining 15% are known as functional IMs, meaning, that their organization is primarily composed of other IMs. Perceptions of the interviewees, therefore, were primarily based on relatively brief observations of peers and subordinates performing duties outside the graduates' own organizations.

The third limitation is that 18 of the 24 IRM graduates have been assigned to headquarters or separate operating agencies, not all MAJCOMs (AF Space Command, Air University, Alaskan Air Command, and numerous other AF elements) were

represented, i.e. no graduates had experience in these commands.

Justification for the Research

The researcher cites five arguments as a rationale for this study. The first is clearly stated in the opening line of the 1990 USAF IM Strategic Plan:

> Educating and motivating people are the key to IM's future success. We need professional information managers employing Total Quality Management (TQM) concepts and skills to guide our transition to the future...program managers with both management expertise and Information Resource Management (IRM) knowledge--will develop policy for managing information in the electronic environment. (72:1)

The education and motivation of IM's people are its top priority (72:1). Senior Air Force management directs that IM must concentrate its efforts in this area. Secondly, Coleman's (8) 1988 research concluded that 95% of IM officers believed technical computer-oriented training was needed in order to improve their mission performance. Third, no formal Air Force research has been conducted which identifies IM's specific educational needs or supporting training methods; yet, the Strategic Plan recognizes education as a key to IM's success (72:1). Fourth, the resources under IM's management and control are staggering. The January 1989 issue of Government Computer News, estimated that more than 540,000 desktop and laptop computers were operating in Air Force offices (51:1). Based on cost factors provided by the Nolan Norton Institute, this

represents nearly 10 billion dollars and 34 percent of the total number of microcomputers in the Federal government--excluding intelligence, command, control, and communications computers (27; 51:1). Quite possibly, these costs are exceeded only by the intangible value of the information maintained on the systems and the people who manage them.

Finally, the large associated IM investment costs give rise to a fifth argument which supports this research. Utilization and implementation of information management technologies is a highly visible and well documented problem area (16; 76). While there are few formal Air Force studies that address this issue from an Air Force IM's perspective, other DOD components and civilian professional literature abound with examples of poorly performing information management systems (1: 12; 16; 24; 30; 31; 48; 63).

Studies by Smith (66) and Swanson (70) support the notion that, in almost all respects, Air Force information management reflects the information management environment of society (66:69, 70:178). Thus, the absence of formal AF IM studies likely reflects the absence of formal research and not the absence or presence of poorly performing information management systems. Nevertheless, there are indications of a perceived "gap" between IM job skill requirements and the training provided. A through review of the literature explores such a premise in the following chapter.

II. Literature Review

> The White Rabbit put on his spectacles. "Where shall I begin, please your Majesty?" he asked.
> "Begin at the beginning," the King said, very gravely, "and go on till you come to the end: then stop." (44:1)
>
> Lewis Carrol 1865

Overview

The literature review is divided into two sections. The first provides background information which will be used to support the second--related studies. The background provides the reader with conceptual views of the AF IM mission, information as a resource, and a career field immersed in rapid technological change. These changes tend to increase the need for new IM skills, thus a review of current IM training opportunities is provided.

The second section reviews several noteworthy IRM studies that were used to provide the foundation for this research. Primary among those is the work of Captain Cheryl Coleman, the first IRM graduate to conduct formal research in IM training needs.

Background

The literature review began with an examination of all previous theses published by AFIT IRM graduates assigned to the IM career field. In total, there were 24 such theses, of which, one graduate student had investigated issues

unique to the Air Force Information Management (IM) field--A Determination of the Perceived Computer Literacy and Computer Training Needs of Air Force Administration Officers, by Captain Cheryl Coleman (8). A more detailed report of her research is presented later in this chapter; however, the earlier allusion to her study is meaningful because it initiated the authors's interest for follow-up research in the IM career field.

Mission of Information Management

The career field of Information Management is composed of Air Force Specialty Codes (AFSC) 70XX (officers) and 702XX (enlisted). In total, there are approximately 22,400 IMs serving worldwide. These officers and enlisted members are responsible for the management of information in all forms: electronic, microform, and paper (19:1). However, it was not until 1982 that delineation of IM's responsibility in the world of office automation was addressed to IMs in an AF regulation. Air Force Regulation 4-1, Functions and Responsibilities of Information Management Activities, stated that IMs must:

> Utilize the Office Information Systems (OIS) team approach, when automating administration for an organization, and consider total office support and resource requirements. (18:3)

Subsequent actions indicated a trend toward more technical orientation after a 1986 reorganization of the Department of Defense tasked IM to "provide the management and policy to

govern all Air Force information--electronic and written" (8:1; 19:1). This action was, perhaps, one of the Air Force's most important steps toward optimal use of one of its most important and available resources--information. The trend continued through 1988 when AFR 4-1 was revised and the scope of IM responsibilities was further increased to include:

> ...planning, programming, and budgeting the resources necessary for: 1) Administrative communications processing and management, 2) Electronic mail and facsimile machines, including maintenance of standard electronic mail addresses. (19:7)

The December 1988 version of Air Force Regulation 4-1, Functions and Responsibilities of Information Management Activities, specified, that "...only information used purely for intelligence and command and control, "was excluded from IM management responsibility. As conferred by the regulation, IM's mission was:

> ...to propose, develop, and implement policy to manage information in any form throughout its lifecycle in support of the Air Force mission. IM includes information collection, paperwork reduction, statistical activities, records, data standards, and sharing and dissemination of information. In addition, IM includes planning, programming, budgeting, training, evaluating, directing, promoting, and managing this valuable resource. It specifically excludes the pure intelligence and command and control functions that are the responsibility of other communities. It uses a variety of technologies, but is independent of the policies and acquisition management of these technologies (Federal Information Processing Resources (FIPR)). (19:1; 65)

This mission statement differed only slightly from earlier versions of the regulation which primarily tasked IM with

record keeping, Privacy Act monitoring, and administrative management of paper-based assets. Most noticeably, the new (December 1988) AFR 4-1 differed from its predecessors by recognizing the use of information technology by IMs to accomplish IM's mission.

Former USAF Director of Information Management, Colonel William Nations described this new IM environment and mission as, "A fundamental departure from the 'DA' [administration] career field of the past" (53; 54). The result of such changes, seems to have raised a great deal of confusion. This point was keenly illustrated by Lieutenant Colonel James Prier, Headquarters Strategic Air Command, Office of Information Management Plans in a paper presented at the Small Computer Technical Center Conference, 9-13 April 1990:

> Today many things impact/impede successful IM mission accomplishment: limited expertise of IM people, inadequate training, difficulty in obtaining resource support for IM mission initiatives and other functional areas' development of information systems and resolution of information management issues without IM input or leadership...no one [is] adequately addressing the needs of executive/staff support 70s... [there are] several reasons for these problems, but one of the root causes may be the lack of a clearly defined mission statement [which is] understood and accepted by all information managers...in short, what is our job? (15)

The Value of Information

The Air Force (AF) has long recognized the strategic importance of electronic information systems--computers. In 1946, General Hap Arnold initiated Project RAND (later to

become the Rand Corporation) as an initiative to develop a computer capable of solving linear equations (28:1; 49). Over the years Air Force leadership has maintained its high interest and increased its investments in computers. In 1951, Mr. Marshall K. Wood, one of the Air Force's computer pioneers, concisely stated the rationale for commanders' use of computers:

> It was once possible for a Supreme Commander to plan operations personally. As the planning problem expanded in space, time, and general complexity, however, the inherent limitations in the capacity of any one man were encountered. Military histories are filled with instances of commanders who failed because they bogged down in details, not because they could not eventually have mastered the details, but because they could not master all the relevant details in the time available for the decision (13:12-13).

Early AF uses of computers were primarily linear programming and accounting-based operations, which were used to provide the Air Force's commanding generals with estimations of air-war fighting capabilities based on Congressionally approved funds (13:12-16; 28:1). General E. W. Rawlings, former Comptroller of the Air Force, was one of the first military commanders to use computers for management assistance (13:14). His leadership in integrating management decisions with computer capabilities dawned the era of computers, and later, what was to become Air Force Information Management (13; 28; 49).

Birth of the AF Information Management Career Field

The reorganization of the Department of Defense (DOD) in 1986 initiated assignment of Information Resource Management responsibilities to the career field of Administration (8:1). Two landmark memorandums initiated these actions: 1) Secretary of the Air Force Order (SAFO) 110.1, 19 November 1987; Authorities and Duties of the Administrative Assistant to the Secretary of the Air Force, and 2) SAFO 560.1, 7 September 1988; The Air Force Information Resources Management Program. As these documents were implemented, the Headquarters Air Force Directorate of Information Management (formerly Administration) assumed direct responsibility for all non-Command, Control, and Communication management information systems (19:1). These new responsibilities impacted the Administration world strongly and later prompted its leaders to change the name of the career field. Lieutenant Colonel James Jeske, former director of Administration, Headquarters Air Force Communications Command explained the name change of "Administration" to "Information Management" in the 17 February 1989 issue of Intercom:

> Air Force information managers will continue to do all the duties now accomplished as administrators, but new responsibilities will be added to their (IMs) functional duties such as reports control management and the overall management of information on Air Force systems. But instead of focusing on processing equipment, we will study and improve the management of information itself. (2:1)

Air Force IM--A Career Field in Change and Conflict

During the exploratory phase of this research the author received numerous informal comments that the new course of IM duties appeared to overlap with those of other career fields. Comments like these were expected by the author, primarily because of one particular uniqueness of the IM relative to other AF career fields. Specifically, its members can be found in every type of AF organization.

While several functional areas were mentioned, the communications (SC) career field was the organization referenced most frequently. Overlapping of these two career fields has been formally deliberated among senior AF leaders for several years (53; 54; 75). From an Air Force perspective, the difficulty in separating the two seems largely one of a clear delineation of "The pure intelligence and command and control functions that are the responsibility of other communities," referenced by AFR 4-1 (19:1). The literature indicated that there are numerous "gray areas" which appear, in total, as neither all Communications (SC), Information Management (IM), Intelligence (IN), or any other functional organization (26:4). Mr. Daniel V. Ferens, commenting in Mission Critical Computer Software Support Management, a 1987 Wright-Patterson AFB publication, provided one rationale for the confusion:

> MCCR [Mission Critical Computer Resource] is a relatively new term that can best be understood by a historical review. In the early seventies, computers and software for DoD weapon systems were receiving increased attention: a project called "Pacer Flash" was initiated to develop unique managerial procedures for computer resources. Some DoD computer and software directives existed, but they were mainly geared toward automatic data processing equipment (ADPE) applications such as payroll computation and scientific analysis. These ADPE directives were not really appropriate for the unique requirements of weapon systems computers and software. DoDD 5000.29. "Management of Computer Resources in Major Defense Systems," the first DoD-level directive for computer resources, defined a new term, "Embedded Computer Resources". ECR includes all computers, software, data, documentation, personnel, and supplies embedded within or integral to a weapon system. ECR were now differentiated from ADPE in the way they were to be managed and the governing documents. Problems soon arose with this separation of computer resources in two classes. There were many "gray areas" which were neither "pure" ECR or ADPE. Adding to the confusion was a third type of computer resources, primarily for communications systems, which were managed by a separate Air Force Regulation series. Within in the past few years the Air Force has divided software into two classes: Information Systems Resources and MCCR. ISR now include ADPE and communications software. (26:3-4)

The author notes that the combination of ADPE and communications software in the ISR category provides a "directively" defined argument for commonalities between SC and IM. For example, Fairchild's (26) 1988 research of Mission Critical Computer Resource (MCCR) and Information Systems Resource (ISR) publications, respectively AF series 800 and 700, probed the possibility of unnecessary duplication of effort between organizations using MCCR (SC and others) and ISR (IM and SC) regulations. In his words:

> Mission Critical Computer Resources (MCCR) and Information Systems Resources are developed using separate policies and regulated by different regulation

> series within the Air Force. Since MCCR and ISR are simply different applications for computer systems, it is likely that the Air Force has over-managed these areas by regulating them with separate, yet, similar regulations and policies. (26:1)

Fairchild (26) found that among the eight ISR and MCCR users interviewed, opinion was widely dispersed (26:19). While virtually every level of user from base to the Secretary of Defense agreed that the 700 and 800 series regulations needed revision, and in some instances consolidation, practically none agreed on method or degree (26:29). In Fairchild's opinion, this was largely due to fear by ISR and MCCR policy makers that:

> ...to suggest that the two functions could be combined...could be seen as a chance to reduce the number of available jobs in these areas. (26:8)

Likewise, it is the author's opinion that SC and IM will, in fact, experience an undesirable degree of overlap until similar fears of job and "functional turf" losses can be resolved.

Possibly nowhere has the overlap been expressed more plainly than in the initial documentation which established the AFIT graduate Information Resource Management (IRM) program (6; 17; 42; 75; 61). The interest of both organizations seemed to center on whether the IRM program should be technical or managerial in focus. In practice, the program course work is weighted more toward management of information rather than the raw connectivity issues surrounding software construction and communication (26:175-

177). This may partially explain why the SC community discontinued sending its members to the IRM program after its first year of participation, and the IM community has typically filled more that 90% of the billets available. No further information was found which would indicate clearer definition or resolution of SC--IM functional responsibilities. Therefore, the researcher advises the reader that some IM functions may appear to duplicate SC responsibilities. Several current observations concerning this dilemma were provided by the interviewees; their responses are presented in Chapter IV Analysis.

Indeed, functional separation of IM and SC issues is complex and is likely tied to problematic and political factors which are beyond the scope of this research.

Civilian IM--Conflicts and Concepts

Comparable difficulties within civilian businesses and institutions are supported by the literature (37; 62; 78:4). Nolan and Wetherbe provided a model example of functional overlap experienced among non-IM personnel working in civilian organizations:

> The diversity [of IM] has caused identity problems for MIS research. It is not uncommon for a new Ph.D. to present his or her dissertation on a job interview and have a non-MIS faculty ask, "Is that really an MIS dissertation in computer science, or organization behavior, or quantitative management science, etc.?"
>
> Though MIS researchers can usually agree on whether a particular research paper is MIS research, they are often hard pressed to define specific criteria for their categorization. (56:2)

Nolan and Wetherbe (56) identified IM as a discipline integrated with five academic areas of study: management science, management accounting, management, human behavior, and to a lessor extent computer science (56:4). Only one other area, data processing, was defined to be entirely enveloped by the MIS career field (56:4). Gordon B. Davis, a nationally recognized MIS expert, echoed their premise and encapsulated the concept of MIS:

> The concept of MIS may be viewed as a substantial extension of the concepts of managerial accounting, operations research, organizational theories related to management and decision making. The content of computer science is relevant, but management information systems as an academic discipline is more of an extension of organizational behavior and management than computer science. (15:22)

While Nolan and Wetherbe (56) and Olsen and Davis (15) pointed out MIS's diversity, perhaps Zwass (79) recognized a more important issue:

> Organizations differ in the placement of the senior MIS executive in the management hierarchy. Some choose to appoint a chief information officer; some of the others create such a function in fact if not in name; yet others do neither. Bhanu and T.S. Raghunathan find that the reporting level of this executive is strongly related to the effectiveness of the organizational MIS function. **The conclusions of this study should not go unnoticed by firms intending to increase the leverage of information technology.** (79:4)

In summary, a review of these findings imply that information management, whether Air Force or civilian based, is a diverse and developing career field. Expressed concerns of functional overlap among various organizational leaders frequently appear in both environments. Sue Weber,

speaking to the attendees of DSS-89, the Ninth International Conference on Decision Support Systems, stated that this concern extended beyond the leadership level and well into the realm of traditional workers:

> For many such individuals [those with little or no computer experience], especially those who formerly used the strength of their bodies rather than the keenness of their minds to earn a living, the transformation of data into meaningful information and the intelligent use of that information have become intimidating and public challenges. (77:198)

Similarly, IMs must also face this reality--an environment which is dramatically different from that of the "administrator" of the past.

Air Force Information Management--A New Paradigm. The author suggests that the advent and acceptance of AF Information Management, as an AF career field, represents a new Air Force paradigm which closely parallels the advent and acceptance of general systems theory to the management science career field. Kast and Rosenzweig describe the characteristic actions which tend to accompany such new conceptual ideas:

> New paradigms frequently are rejected by the scientific community. ...they frequently lack the sophistication of the older paradigms which they ultimately replace. They do not display the clarity and certainty of older paradigms which have been refined through years of research and writing. But a new paradigm does provide for a "new start" and opens up new directions that were not part of the old. Paradigms gain their status because they are more successful than their competitors in solving a few problems that the group of practitioners recognize as acute. To be more successful is not, however, to be completely successful with a single problem or notably successful with any large number (of problems).... As in other fields of

> scientific endeavor, the new paradigm must be applied, clarified, elaborated and made more precise. But, it does provide a fundamentally different view of the reality of social organizations and can serve as the basis for major advancements in our field. (45:74)

In the case of IM, the old paradigm is represented by the "feet and fingers" world of "administration" described by Porter in Chapter I (60). The new IM paradigm remains yet to be deciphered, but the advent of the AFIT IRM program may begin a framework for its definition.

Computer-Oriented Training of Information Managers

The diversity of opinion just discussed and the early stage of development for the new AF IM paradigm clearly point to the need for research on training needs of the new field. Research in this area revealed that computer-oriented training of information managers was divided into two groups, officers and enlisted members (7; 64).

IM Officer Training. According to Major Candice Schaffer, Course Director, for the Air Force's officer-level IM training school:

> Computer-oriented training for new IM officers was minimal; there was practically none! It was little more than a few minutes of exposure of the students to a Zenith 248 without the cover on it. (64)

Subsequent telephone interviews with former and present course instructors also indicated that no computer-oriented instruction had been included in the Basic IM Officer course curriculum (8; 59; 64). However, welcomed changes to this situation are imminent (64). Major Schaffer related that

the USAF Office of Occupational Testing, Brooks AFB TX, had approved the addition of 58 contact hours of computer-based training and 37 small computers (64). The new curriculum will include training in spreadsheets, database management, electronic mail, wordprocessing, and networks (64). In Shaffer's words "We are moving out of the 'Dark Ages', headed in a positive direction, and moving out of the world of paper" (64).

IRM Program. In 1984, senior leadership at the Air Force Directorate of Administration recognized that a critical MIS literacy void existed among its IM officers (17). On 1 November Colonel James H. Delaney set in motion an initiative which would someday offer a select group of IM officers a Masters of Science degree in Information Resource Management (IRM). In his letter to the Air Force's top education authority, Colonel Delaney expressed the importance of the program:

> Earlier this year, we alerted you to the fact that we would soon be making a formal proposal for a funded advanced academic degree in Information Resources Management (IRM). We have now completed our study and have concluded that the proposed degree is in fact needed and that failure to bring it on line and fund it will negatively affect continued mission support. (17)

Fruition of that letter was realized in April of 1986, when the first group of four IM officers reported to the Air Force Institute of Technology to begin an 18 month 78 quarter hour program in Information Resource Management. The curriculum for the program, "...emphasizes the

management aspects of effectively designing, developing, and implementing information systems in Air Force organizations" (3:13). A complete listing of the program's current curriculum is provided at Appendix A.

Early indications of the IRM program's effectiveness have been encouraging. Subjective feedback from SAF/AAD and several MAJCOM IM Deputy Chiefs of Staffs (DCSs) indicates that they are pleased with the performance of IRM graduates and that IRM training results in improved mission performance and utilization of management information systems (52; 53). While the program is highly respected, it also bears one primary resource constraint. Each year only ten IM officers can be selected. This number represents less than one percent of available IM officers and provides quantifiable evidence that alternate forms of training and education should be considered for the remaining 99+ percent.

IM Enlisted Training. Technical Sergeant Mary Chong, Instructor Supervisor, for the Air Force's enlisted IM training center, Keesler AFB MS, provided the researcher an overview of enlisted IM computer training:

> New IM troops receive a maximum of 23 days exposure to computer-based training with most IMs completing the curriculum in 17 to 19 days. They [Enlisted IMs] are taught to "boot-up" a preset Zenith 248 and utilize some wordprocessing features of ENABLE software (7).

Answers to other questions presented by the researcher indicated that no additional computer operation or

application courses were included in the training. Primarily, the instruction focused on teaching IMs typing skills (7). Sergeant Chong advised that more computer-based courses were needed, but are currently, "not included in their program" (7).

The above review of officer and enlisted training and educational opportunities clearly makes two points. First, identifiable progress has been made with regard to the training available to IM officers. The IRM program and new entry-level computer-based training are indications that IM's leadership has successfully directed positive changes. While these are encouraging signs, field level effects of these changes are not likely to be realized in the near future. The IRM program produces only a small number of graduates, entry-level officer training has not yet been implemented, and entry-level enlisted members are offered only incidental IRM training.

Related Studies

One of the most commonly referenced and respected studies focusing on the skills needed by MIS professionals was led by Ashenhurst (4) in 1972 (8; 15; 57; 58). Acting on behalf of the Association for Computing Machinery (ACM), Ashenhurst and others established an information system research committee. The Committee's charter detailed two primary activities:

> (1) developing detailed course outlines for major new courses necessary for a professional program in systems design; (2) recommending new fields of specialization in existing [MIS-related] programs. (4:364)

Their study addressed, in Ashenhurst's words, "...a widely felt need for individuals who can bring to bear the relevant computer technology on the information requirements of particular organizations" (4:365). It was an initiative born out of two major shortfalls which were exhibited in the performance of the MIS professionals of that day:

> ...individuals currently being hired for entry level [MIS] positions...have an educational background inadequately suited to the job requirements, and those already filling such positions have only experience to qualify them. (4:369)

Ashenhurst (4) noted that the problem focused tightly on the absence of available education opportunities which integrated technical and organizational concerns. In particular, he stated that, "...existing computer science education...does not prepare the student for the discipline of evolving system specifications" (4:369). There were symptoms causing suspicion that the business spotlight had been too long focused on evolving technology and silently diverted from a more important issue--technology application (4:369).

By conducting extensive interviews with prominent academic and industrial leaders, the Committee developed a an applications-oriented curriculum approach. Through the Committee's efforts four areas of MIS integration in education and business were defined: organizational

planning, operation and control, information system operation, and information systems development (4:366). The Committee's final report stated that the "output--characteristics of graduates" of their curriculum should produce knowledge and abilities in the following six categories: people, models, systems, computers, organizations, and society (4:370). They further noted that knowledge in the first three categories (people, models and systems) could be regarded as tools for utilization of the final three (4:370). A complete listing of the Committee's recommendations of needed knowledge and abilities can be found at Appendix B. Their conclusions indicated that their work should be accepted as prototypical in nature and that future refinements were needed to keep pace with rapidly changing technology (4:382-383).

As recommended by Ashenhurst's (4) 1972 study, the curriculum underwent constant additional review, and in 1980 a new committee was established to conduct a comprehensive review (57:782). Two well respected members of the original committee, J. D. Cougar and Gordon B. Davis, remained members and provided academic integrity and transition knowledge to the new committee's project (4; 57). The Committee reported their findings in the November 1982 issue of the Communications of the ACM. Titled, "Information Systems Curriculum Recommendations for the 80s: Undergraduate and Graduate Programs--A Report of the ACM

Curriculum Committee on Information Systems," the report presented, "...the continuing need for education related to the definition, analysis, design, construction, and management of information systems in organizations" (57:781). Three new factors were identified as significantly impacting the need for a current and appropriate curriculum:

> 1)...the increasing responsibilities of supportive [vice computer science] computer personnel and the crucial role that they play in the efficient and successful computer-based system; 2) the need for increased organizational productivity; 3) labor economics and skill requirements in the private and public sectors have resulted in increasing demand for more information systems and broader applications of the information systems technology. (57:783)

Several additions were made to the updated curriculum which have potential relevance value to this research. The first item of note was the identification and development of a defined path of MIS career progression (57:784-785). The Committee defined three levels of MIS professionals: systems analysts, applications programmer/analysts, and information systems specialists. Each is presented in increasing order of career field breadth. Systems analysts positions are generally of entry level status, which pair the analyst with various users to develop information requirements (57:785). Applications programmer/analysts present a more specialized employment of MIS skills by enabling the individual to concentrate on a single area of expertise (57:785). Finally, information systems

specialists perform duties such as information system planning, administration, and resource management (57:785). The identification of an MIS career progression has bearing on this research because no comparable career path for AF IMs exists.

Secondly, their study identified both general and specific perquisites for required entry into MIS career programs (57:786). These are presented in subject area format and located at Appendix B. The utility of requiring perquisites in an AF/IM context may offer new alternatives to costly education and training conducted after a member enters the career field. This topic was addressed in detail by the instrument presented in Chapter III Methodology. Further discussion of this topic continues in Chapter IV, Analysis.

Finally, it should be noted that the listing of needed MIS knowledge and abilities (Appendix B) prepared by the Ashenhurst (4) study was regarded by Nunamaker's (57) group as, "...still the most comprehensive available" (57:785). Based on that premise, Parisian (58) utilized their work to research the skills most needed by university and business AIS directors. Parisian, was unable to find anything in the literature that directly related to the topic (58:2). In her words:

> Most research dealt with business uses of computing services, especially hardware and software applications. What little there was devoted to university applications was divided into academic and

> administrative computing, focusing on software, Management Information Systems (MIS) or executive management's use of data processing. (58:2)

Her dissertation, Management Skills Perceived Necessary for Directors of Administrative Information Systems in University and Business Settings, surveyed two discrete groups with MIS related requirements. Sixteen individuals were selected by former Michigan State University (MSU) President, Dr. Edgar Harden and MSU AIS Department Director, Dorothy H. Hopkin as expert sources for the information desired. Fifteen of sixteen completed the survey, nine of ten "Big Ten" University AIS Directors and six greater Lansing Michigan area, chief executive officers (58:30-31). Parisian's survey was constructed in three parts. The first portion asked respondents to rate the importance of the skills identified by the ACM studies (4; 57), relative to AIS directors in general (58:91). Using the same questions, part II requested that the respondent rate his personal ability within that area. In doing so, Parisian hoped to provide a "reality check" of the respondents' answers. The final portion, Part III, requested demographic information which could subsequently be used for future research comparisons.

Parisian's (58) methodology employed provided this researcher with a respectable model for this applications

oriented research, which Coleman (8) began. Her study, A Determination of the Perceived Computer Literacy and Computer Training Needs of Air Force Administration Officers, was the first formal research to review the training needs of information managers. Coleman (8) concentrated on identifying the "computer literacy" of CONUS-based AF information management officers. The study consisted of a survey of 383 IM officers, of which, 253 returned useable responses.

Coleman's (8) findings were the first and, to date, the only graduate level research which addressed educational needs and learning preferences of Air Force information managers. Specifically, the study concluded that, "the sample of respondent IM officers did not have a strong background in computer skills" (8:77). Despite this conclusion, IM officers reported that they were assigned tasks which required computer skills. Twenty-five percent indicated that, "they have current job demands that they cannot effectively meet with their current level of computer knowledge," and 85%, "...believe more computer training would improve their on-the-job effectiveness" (8:79). These observations clearly support the contention that IMs believe there is a void between what information managers do know and what they need to know (8:28).

In summary, Coleman's (8) study was an important beginning for IM research, but its focus was somewhat generic in nature. It recognized a need for more computer literacy among AF IM officers; nevertheless, it failed to specify the topic area skills needed by the officers to do their jobs.

This researcher's intent is to move at least two steps closer to the application of AFIT-gained knowledge to field-level needs. The first is to identify specific MIS related skills needed by Air Force Information Managers. The second is to offer a prudent strategy for training and education of IMs where little or no opportunity presently exists (7; 64). Finally, this research offers an occasion to attempt a candid appraisal of the perceived effectiveness of the IRM program by its 24 graduates. Such feedback is of recognizable value because it provides future researchers with some insight as to the outlooks and opinions of the primary information sources used to complete this study.

Review of these IRM related studies suggests that formal research in this area is in its infancy. Given that, the author chose to use an established research approach known as "Needs Analysis."

A Definition of Needs Analysis

The objectives pursued here constitute a needs assessment research. Kaufman (40), in his book, Educational Systems Planning, defined the term:

> An educational need is defined as the measurable discrepancy (gap) between current outcomes and required or desired outcomes. The important notion is that to have a need we must identify and document that there is a gap between two outcomes, that which is currently resulting and that which should be resulting. The setting of the two polar dimensions of a need should be done in a formal way, and such a procedure is called "needs assessment." (40:5)

He offers two reasons for a structured approach to needs assessment: both are critical to this research. First, poorly defined problems yield an infinite number of solutions. Second, there is little assurance that solutions are addressed to the most important problem rather than visible symptoms (40:7). According to Kaufman (40) needs assessment research requires the following three basic characteristics:

> 1. The data must represent the real world of learners [the Air Force information managers] and related people, both as it is now and as it will, could, and should exist in the future.
>
> 2. No needs determination is final and complete; we must realize that any statement of needs is in fact tentative, and we must consistently question the validity of our assumptions.
>
> 3. The discrepancies should be identified in terms of products or actual behavior (ends), not in terms of processes (or means). (40:9)

Summary

The above description of needs assessment research brings the literature review to a close. Recollection of several basic ideas are key factors toward understanding the methodology employed in Chapter III. A case has been presented to show that the IM career field is in a state of

rapid change, much of which may be attributed to transformations in the technology used to perform the IM mission. The change is accompanied by conflict from within and outside the IM environment. Internal conflict appears where job demands exceed job training, and external struggles exist where jobs appear to overlap. Only the internal conflict is addressed by this research. The significance of the literature review is that it supports the premise that more IRM-related training is needed by the 22,400+ IM officers and enlisted members in the field, yet, little is available. Coleman (8) began the task of identifying the skills needed: this research continues with the specification of the nature of these skills and desired methods for achieving them.

III. Methodology

Prepare your work outside, and get it ready for yourself in the field; afterwards, then build your house.

Proverbs 24:27

Introduction

The purpose of this chapter is to describe, define, and justify the means by which the research interview questions listed in Chapter I were investigated. It provides a formal and detailed record of the methods and procedures employed throughout the research process. The chapter begins with a discussion of several recognized methods of research and the identification of the two types utilized in this study. Following a description of the population and sample, the researcher provides justification and description of the instrument (telephone interview) and its related attributes. Next, definitions bearing on the validity of the interview process were stated. The chapter closes with an explanation of the type of data gathered, the analysis tools used, and the rationale used for their selection.

Foreword on MIS Research Methodologies

Two researchers who have studied MIS research methods, are Baroudi and Orlinikowski (5). They state that, "In a survey of five years of MIS research, we found the average levels of statistical power to be relatively low (5:104). In their own words, "typically MIS researchers have a 40

percent chance of not detecting the phenomenon under study, even though, in fact, it may exist" (5:87). In response to these alarming statistics, Baroudi and Orlinikowski (5) have recommended adherence to four cardinal practices relative to reporting MIS research. These suggestions are presented below:

> We urge that all published empirical studies report...
>
> 1) ...a detailed description of the sites or situations studied, as well as the measures employed and their particular psychometric properties.
>
> 2) ...the number and characteristics of subjects involved, including how they were selected and motivated to participate in the study.
>
> 3) ...the rationale of the power analyses (including the appropriate effect-size estimates) and the statistical power of the test performed.
>
> 4) ...the sample effect-size levels actually obtained (e.g., expressed as proportion of variance measures), in addition to the significance information provided. (5:104)

Items one through three were incorporated in this methodology. However, the data collected in this study was primarily ordinal in nature; therefore, analysis of variance tests could not be validly employed.

Investigative Questions

For convenience, the research questions presented in Chapter I are repeated:

1. To what extent are USAF information managers knowledgeable of various information resource technologies and techniques?

2. To what extent should USAF information managers be knowledgeable of relevant information resource technologies and techniques?

3. What are the most practical methods for teaching/training needed skills to information managers?

4. How do IRM graduates perceive the effectiveness of the AFIT IRM program in providing needed IM officer skills?

Description of Research Methodology

Isaac and Michael (36) defined nine basic methods of research: Historical, Descriptive, Developmental, Case and Field Studies, Correlational, Causal-Comparative, True Experimental, Quasi-Experimental, and Action (36:41). Each offers the researcher an objective vehicle to accomplish his purpose. Historical research provides objective analysis of the past. Descriptive research portrays a situation or area. Developmental research explores change over time. Case/field studies intensely investigate and objectively reconstruct the past. Correlational studies attempt to relate a single variable with one or more others. Causal research attempts to discover cause and effect relationships. True experiments control both subjects and treatments while quasi-experimental studies approximate conditions of true experiments.

This research employed a combination of two such methods: descriptive and developmental. Descriptive research was used to construct an aggregate representation

of all IRM graduates' perceptions of Air Force IM in two time horizons--1990 and 1995. Developmental research was utilized to assist in identification of the IM skills that are expected to be needed over the next five years.

Population

The population of interest consisted of all Air Force Information Managers (IMs). In total, approximately 22,400 officer and enlisted members compose this population--20,000 enlisted members and 2400 officers (53). Enlisted grades of the population range from entry-level airman basic (E-1) to Chief Master Sergeant (E-9). Officer grades range from second lieutenant to Colonel. Currently there are no general officers serving in the IM career field.

IM presently offers two career paths: executive support and functional administration (19:1). Roughly 85 percent of all IMs serve in executive support positions. Coleman defined the officer portion of this population:

> Company grade executive support officers are identified with AFSC 7024; field grade in the same group are identified by AFSC 7016. Functional administrators also have two AFSCs, 7034 for company grade officers and 7046 for field grade. Functional administrators are normally assigned in positions functionally aligned under a Director of Administration [Now Information Management], while executive support officers are assigned to every functional area in the Air Force. Because administration [IM] officers are encouraged to gain experience in both career areas, officers on the second or more jobs may have experience in both the functional and executive support areas. (8:26)

Enlisted information managers (EIMs) are likewise divided into executive support and functional IM. EIMs serving in executive support capacities are designated as AFSC 702XX, and those assigned to functional IM positions as AFSC 703XX. Of note is the fact that the EIM population has recently been changed by the conversion of orderly room manning authorizations from information management to personnel. These individuals are peripherally effected, but are not included as members of this population.

Sample

The sample selected for this research was that of all graduates of the Air Force Institute of Technology's Information Resource Management (IRM) program. In total, 24 information managers have completed the IRM program. All 24 completed the research interview. The rationale for selection of this sample evolved as a result of three primary factors: recommendations by IRM and research experts, recognition of GIRs as "the best IM resource available" by senior AF IM managers, and the researchers's personal conviction that the positions assigned to program graduates gave them a better "future-looking" perspective than most of their peers and subordinates in the field.

The first factor emerged in November of 1989, during a proposed thesis topic defense to an informal staff committee consisting of the IRM program manager, Lieutenant Colonel D. J. McBride; DSS program manager, Major Chris Arnold;

Associate Professor of Technical Communications and Research Methods, Dr. Charles R. Fenno; and various members of the GIR90D graduating class. A theme emerged from the discussion which was later developed as the framework for this research. Central to that theme was evaluation of the IM career field needs by IRM graduates. In 1983, Halsey and Hooper (32) completed a study of similar nature on the AFIT Graduate in Engineering Management (GEM) and Graduate in Facilities Management (GFM) graduate programs (32:35). Much of the format presented herein is attributed to their model (32).

The second influence on selection of the IRM graduates was the high regard key AF IM senior managers have expressed for GIR expertise. The Director of Air Force Information Management and many of his MAJCOM/DCS staffs have described the graduates as, "...the best IRM resources available" (33; 53; 54).

The final factor was based upon the eclectic and potentially strategic viewpoints available to the graduates as a result of their relatively unique positions. Fairchild also used "specialists" in his research of distinctive subject matter:

> Interviewing the policy makers and users of these policies is a valid method for solving these problems because there is very little likelihood that there are individuals more knowledgeable of this subject in the Air Force, or elsewhere, than those identified as interviewees. (26:9)

Eighteen of the twenty-four graduates were assigned to MAJCOM or specialized SOA locations. Twenty-two were CONUS based and two were located overseas. Fourteen of the graduates had completed a minimum of 18 months service in their current position. The remaining ten individuals had completed six months time on station. (Four were assigned to MAJCOM headquarters positions and six were assigned as the Base Chief of Information Management at five stateside and one overseas location.) All responses were treated equally: no differentiation of experience, assignment, or other factors is reflected in the accompanying analysis. In summary, almost 80 percent of the graduates were located in MAJCOM or specialized IRM development programs such as the Air Force IM Standard Systems Project at the Small Computer Development Center at Gunter AFB AL (RAMS, RIMS, and PDOS). All graduate positions, including the six base level jobs, were described as future-oriented and computer-based (33; 53; 54). Such positions are not typical of the AF IM community as it currently exists. This is supported by Coleman's findings.

> Few of the officers [in her research] are managing information systems. Only about 4% of the administration [information management] officers surveyed are currently assigned to a position that requires them to hold a "C" (computer) prefix. (8:82)

In contrast, the IRM graduates were designing, developing, and implementing the computer and information system resources that are currently and will be subsequently

arriving in the hands of field level information managers. As a result, many of the topics studied in this research are largely unknown to IMs at most bases. Therefore, interview or survey of randomly selected field level IMs was judged by the researcher to be inappropriate for the research objective. From an operational perspective, these 24 IRM graduates served as functional experts. Stewart (67) described unique characteristics of such sources:

> Experts provide primary data about their field of expertise unlike any other source of information. The information from experts is also timely and can reflect current changes to the industry that have not yet been written about.... (67:46)

As noted in the literature review, IM is undergoing extensive and dynamic technological change, and these graduates are the first level implementers. In effect, they are change agents, of Air Force information management, and their job has much to do with bridging gaps between old and new IM technology (15:594; 46).

Instrument Implementation Description

Emory has suggested two possible methods of data collection--survey and observation (22; 25:157-158). Survey is the process of questioning and recording (25:158). According to Emory, surveys may be conducted through the use of personal and telephone interviews or written surveys (25:158-176). Telephone interviews were selected as the most appropriate method for the researcher's purpose. The interview instrument, provided at Appendix C, was composed

of three parts. Part one collected demographic characteristics about the graduates. The second part identified 37 specific topic areas and assessed both the present and needed levels of IM expertise for each topic. The third part addressed the effectiveness of the AFIT IRM graduate program.

Several arguments are presented for the use of telephone interviews. Most importantly, interviews provide the greatest degree of information depth and detail (25:160). In Emory's words:

> It [interview] far exceeds the information secured through telephone and mail surveys. The interviewer can also do more things to improve the quality of the information received than with other methods. Interviews can note the conditions of the interview, probe with additional questions, and gather supplemental information through observation. (25:160)

Additionally, he identified three conditions for successful interviews: (1) the respondent's availability, (2) understanding of his role, and (3) his motivation to cooperate (25:161). Conscious management actions were exercised throughout the course of this research to optimize each condition. A detailed review of these actions follows.

Respondent Availability. Respondent availability was accomplished through four primary actions: (1) The names and addresses of each IRM graduate performing duties in the IM career field were collected informally and compared with an identical listing made available by the Air Force Military Personnel Center (MPC). (2) Two weeks prior to

planned initiation of interviews, a letter (Appendix C) was mailed to each eligible respondent informing them of the researcher's intent to conduct telephone interviews during a two week period in June of 1990. (3) One week prior to the interview, the telephone numbers were tested for accuracy. This allowed the researcher an early opportunity to locate members who had been reassigned, establish rapport, explain the interview objectives, answer preliminary questions, and schedule most of the interviews. The respondents expressed appreciation for this courtesy and appeared to take an immediate personal interest in the subject matter (4). Finally, with two exceptions, calls were made as scheduled. As a result, the interviews were conducted unhurriedly and in a structured format which aided the progressive "flow" of each interview.

It should be noted that all calls were made using the DOD AUTOVON telephone system. Prior coordination with AUTOVON telephone operators assisted greatly in completing two uninterrupted overseas calls.

Respondent Role. Respondent roles were defined by the researcher and explained to the respondents on not less than three occasions. The first explanation was provided in the aforementioned letter (Appendix C). The letter provided respondents with a detailed listing of all subjects to be

covered during the interview. In addition, the order of question presentation, respective scales, and a suggested range of responses were furnished.

Individuals were informed that the suggested responses were provided as guidelines rather than boundaries: their candid and open responses were desired. In practice, most respondents did choose responses from presented alternatives; however, several did not. All responses are presented in detail in Chapter IV.

The second occasion to clarify respondent roles occurred during the testing of phone numbers. In 22 cases, the individuals had received the interview notification letter, reviewed the "pre-interview" information attachments, and formulated relevant questions. The researcher provided answers to the extent that the individuals desired to continue. In 11 instances, the respondents requested that the interview continue from that point rather than scheduling it at a later date: each was accommodated.

A third clarification of respondent roles was provided at the beginning of each interview. This was completed through the use of an interview checklist located at Appendix D, which was seen only by the interviewer. The essence of the checklist covered four key points: (1) an overview of the two time horizons studied (1990 and 1995) and the interview agenda; (2) an explanation of the response

scale continuum and teaching/training method definitions used in the first two interview questions; (3) an explanation of the term "in general" as it was applied to the research questions; and finally (4) presentation of the topics, an opportunity to ask questions, and a final word of appreciation for the respondents cooperation and time.

A fourth opportunity to explain the respondent's role sometimes developed during the interviews. On rare occasions, the topic for discussion digressed beyond the scope of this research. These circumstances made it imperative for the interviewer to reorient the discussion in order to continue the interview. Although such "coaching" increases the potential for bias, it is a recognized and sometimes necessary procedure (25:161). Conscious efforts were made to avoid interviewer bias.

One additional point must be made with respect to the respondents. It should be reiterated that each respondent had completed the AFIT Information Resource Management (IRM) program within the past three years. Therefore, each was familiar with the research concepts of bias, validity, reliability, and practicality. The author contends that such respondent knowledge is helpful in improving this research's validity.

Respondent Motivation. Emory notes that respondent motivation is a primary responsibility of the interviewer (25:161). As such, potential interviewers should be

familiar with available options that can be used to influence respondent incentive. These options include:

> ...explaining what kind of answer is sought, how complete it [response] should be, and in what terms it should be expressed. (25:161)

As the preceding discussion indicates, these factors were explicitly addressed in the instructions to respondents. Kahn and Cannel also conducted research pertinent to respondent motivation (39:153). Their findings indicated the following factors should be considered relative to respondent motivation: (1) pressure of competing activities, (2) attitude of respondent toward interviewer, (3) embarrassment at ignorance, (4) prestige of the research agency, (5) respondent's attitude toward the subject matter, (6) image as a dutiful citizen, (7) fear of consequences, and (8) loneliness (39:153).

Because these interviews were scheduled based on the respondents' requests and conducted in a structured format, few other activities were competing for the respondents attention. In large part the interviews were conducted either early in the morning or late in the afternoon, relative to the respondents, time zone. The interviewer's geographical location in the Eastern Daylight Time (EDT) zone permitted completion of most interviews between 0800 and 1700 EDT; however, calls made to the two overseas locations were made between 2000 and 0300 EDT.

Relative to the respondents' attitudes toward the interviewer, all individuals displayed courteous and professional demeanor throughout the interviews.

Threats of perceived ignorance relative to the subject matter were minimal in virtually all areas. The interviewer noted that there were three possible exceptions to this statement: Macintosh operating systems (interview question 1B), Wang computer hardware (interview question 6B) and ADA programming (interview question 7F). All were found only in extremely unique IM applications. By contrast, 22 of the topics were, as a minimum, conceptually covered by the AFIT IRM curriculum and 12 more topics related to AF-wide IM concerns, e.g. DDN, RAMS, RIMS, and PDOS. To further their knowledge, the respondents indicated that they previously and frequently conducted cross-talk discussions about many of the interview topics.

Several of the graduates noted that they had established close professional relationships while at AFIT, and now continued those relationships over local and wide area networks--sometimes on a daily basis. Thus, while all respondents were not equally knowledgeable on all subjects, there was evidence to support Chapter I's assumptions that the graduates were familiar enough with topics to have informed opinions on them.

As previously noted, all respondents were graduates of the Institute and thus prestige of the research institution,

AFIT, was believed by the researcher to have a neutral effect. They expressed neither contempt nor inappropriate esteem for the research agency. All respondents expressed recognizable enthusiasm at being given the opportunity to comment on the presented subject matter. Most commented that this was the first formal opportunity they had received to provide feedback relevant to the career field and the IRM program.

The respondents' professional conduct and expressed willingness to cooperate in the interview indicated a high degree of commitment and a positive self-image as a dutiful citizen.

From the outset of the research, respondents were informed of the anonymity of their recommendations. Notwithstanding that, virtually all graduates encouraged the interviewer to print their name with their comments. Thus, no fear of consequences is believed to have influenced respondent answers.

Finally, the interviewer noticed no characteristics which would indicate respondent loneliness.

Instrument Definitions

The importance of mutually acceptable definitions between interviewer and respondent cannot be over-emphasized. Consequently, paramount to virtually all research concerns is the concept of validity. Validity

indicates that, in fact, "...the instrument measures what the designer claims it does" (25:94).

Three forms of validity are recognized by Emory: **content validity, criterion-related validity, and construct validity** (25:94-98). The terms are often addressed separately and to varying degrees. However, to be effective tools, they must be applied in aggregate (25:97). In this study, there was a strong affiliation between criterion and construct validity. That association is reflected in the discussion below.

Content Validity. Content validity is concerned with the assurance that the measuring instrument provided an adequate review of the topic studied (25:95). Content validity is precisely the area which most differentiates this research from that of Coleman (8). Her study of the computer literacy of AF IM officers provided a formal description of IM officer computer skills and respective training requirements (8:29). By contrast, this research focused on the degree of knowledge/skill and the specific topics to which they would be applied.

With one exception, each of the thirty-seven interview topics was extracted directly from current AF IM operational documentation. The exception, decision support systems, was considered by the researcher, a ten year IM practitioner, to be a potentially important future issue for IM. All other topics were derived from the following sources: current Air

Force IM regulations; weekly minutes of Headquarters USAF Director of Information Management Staff Meetings--September 1989 to April 1990; Minutes of the December 1989 DESTINY Conference; and official, newsletter-style pamphlets published by Headquarters Military Airlift Command (MAC), Headquarters Air Training Command, Headquarters USAF Reserve, and Headquarters Strategic Air Command (SAC)--September 1989 to April 1990.

While all of these sources provided some level of input to the subject matter content, none was more utilized than the Minutes of the December 1989 DESTINY Conference. There, the Air Force Director of Information Management met with all MAJCOM IM Deputy Chief of Staffs (DCS) and selected staff members. As noted by Coleman, "This group of DAs [IMs] meets twice a year and is tasked with charting the direction for the career field" (8:9). The conferences are designed to initiate action and provide information which are of importance to all IMs. For this reason, the minutes of the most recent conference served as a valuable source for "checking the vital signs" of AF Information Management.

Following collection of these documents, each was carefully reviewed for content which related to information technology. As a guideline for inclusion as a research topic, the author selected topics which illustrated either IMs using computers or IMs utilizing information resource management techniques. Subsequently, the topics were

aggregated into seven clusters: operating systems, data communications, IM standard systems, information resource management concepts, the Information Management career field, hardware, and software (57; 58:31). The thirty-seven topics are grouped by cluster and shown in Tables 1-7. All topics were uniquely based on AF operations.

TABLE 1
CLUSTER 1: COMPUTER OPERATING SYSTEMS RESEARCHED

A. DOS
B. MACINTOSH
C. UNIX
D. MAINFRAME (any manufacturer)

TABLE 2
CLUSTER 2: STANDARDIZED IM SYSTEMS RESEARCHED

A. PUBLICATIONS DISTRIBUTED OFFICE SYSTEM (PDOS)
B. RECORDS INFORMATION MANAGEMENT SYSTEM (RIMS)
C. REPROGRAPHICS AUTOMATED MANAGEMENT SYSTEM (RAMS)
D. PERSONNEL CONCEPT III (PCIII)-- IM ASPECTS

TABLE 3
CLUSTER 3: DATA COMMUNICATIONS TOPICS RESEARCHED

A. LOCAL AREA NETWORKS
B. HARDWARE
C. SOFTWARE
D. ELECTRONIC MAIL
E. ELECTRONIC FORMS
F. DATA FAX
G. SECURITY
H. DATA DEFENSE NETWORK

TABLE 4
CLUSTER 4: IRM TOPICS RESEARCHED

A. IDENTIFYING USER REQUIREMENTS
B. CONCEPT OF INFORMATION AS A RESOURCE
C. "IN-HOUSE" IM CONSULTING FOR THE AF
D. DECISION SUPPORT SYSTEMS
E. ESTABLISHING IM USER SUPPORT GROUPS/INFORMATION RESOURCE CENTERS
F. CD ROM OPTICAL DISK USE
G. STANDARD MULTIUSER SMALL COMPUTER REQUIREMENTS CONTRACT (SMSCRC)
H. 50-S CONTRACT

TABLE 5
CLUSTER 5: IM CAREER FIELD TOPICS RESEARCHED

A. IM STRATEGIC PLAN
B. IM NET

TABLE 6
CLUSTER 6: OFFICE HARDWARE TOPICS RESEARCHED

A. SMALL COMPUTERS
B. COPIERS
C. WANG COMPUTERS
D. MAINFRAME COMPUTERS (any manufacturer)

TABLE 7
CLUSTER 7: OFFICE SOFTWARE TOPICS RESEARCHED

A. DESKTOP PUBLISHING
B. SPREADSHEETS
C. DATABASE MANAGEMENT
D. WORDPROCESSING
E. MAINFRAME APPLICATIONS
F. ADA PROGRAMMING
G. GRAPHICS

Construct Validity. Construct validity measures or infers, "...the presence of abstract characteristics for which no empirical validation seems possible" (25:97). Conventionally, determination of construct validity is realized by associating, "a set of other propositions with the results received from using the measurement tool.... If measurements on the devised scale correlate in a predicted way with these other propositions, we then conclude that there is some construct validity" (25:97).

For example, if an individual were presented the following question and alternatives, what would his answer mean? In general, what do certified public accountants (CPAs) need to know about accounting principals? No knowledge, some knowledge, hands-on experience, functional competence, or expert. Many would likely answer "functional competence" or "expert"--meaning that CPAs should have extensive knowledge in the area. However, without an understanding of the scope of alternative answers, it would

be difficult to use the information to effectively measure differences between and among CPAs.

Therefore, to ensure mutual understanding between interviewer and respondent, considerable effort was directed at developing commonly shared operational terms. The following five terms were designated as the instrument response constructs: **(1) "No knowledge", (2) "Some knowledge", (3) "hands-on experience", (4) "Functional competence" and (5) "Expert".** These constructs rendered a continuum of recognizable parameters which were integrated for use on a five point Likert scale. Such scales are ordinal in nature, and are useful to this research because they allow ranking of topics and thus assist in the development of priorities (25:258). Literature supports the use of such scales as an effective means to describe topics which are, "...highly specific to the case and content of interest" (25:253). One authority acknowledged the use of scales as, "...the most useful in behavioral research" (36:142). There is, however, "...one major weakness [with arbitrary scales]--a total reliance on the designer's subjective logic" (25:253). Hence, their greatest disadvantage is that the respondent may not view the term from the same frame of reference as the designer. Therefore, as was previously noted, the interviewer placed much emphasis on explaining the definitions, constructs, and objectives of the research before the interview questions

were asked. Paramount to these concerns was the importance of ultimately developing an overall view of Air Force IM knowledge/skill needs.

Several of the respondents were extremely insistent on the need to provide additional criteria which would assist them in making their recommendations. They primarily expressed difficultly in distinguishing what all IMs could or should know. In response, the interviewer stated that their recommendations should take into account competitiveness, future IM systems, and the overall good of the Air Force. Specifically, they were told, "If you put all the Air Force IMs into a box, what common knowledge and skills would the AF want from most of them?"

Subsequent review of this interview interaction, particularly the inclusion of references to "competitiveness" raised a concern of the research's validity (defined earlier in this chapter). Specifically, did the recommendations provided by these individuals reflect what IMs do and should know in general, or what do and should they know to get promoted? While one might assume that the two are the same, no basis for that position was established by this research. Therefore, it was necessary to recontact those individuals and determine from which of the two perspectives the respondents had made their recommendations. The resulting interviews confirmed that all questions had been answered from an Air Force's "best

interests" perspective and not one of competitiveness or individual promotion potential.

Question three, "What is the most practical and effective method/approach for training/teaching the subject matter?" required the development of a separate group of constructs. Here, the respondents were asked to suggest an alternative or choose one of the listed approaches for teaching/training the topics raised by questions one and two. Specifically, they were asked which methods should be used to achieve needed levels of expertise in each area. One possible interview question might be, "What are the best methods to train/educate IMs on relevant IRM topics?"

However, it was anticipated that subjects might suggest sending all Air Force IMs through extensive formal education and training programs such as the Graduate Information Resource degree program at AFIT. Given the impracticality of such a solution, the graduates were asked to recommend the most effective and practical method of resolving differences between what they believed IMs do know and should know about IRM. The methods/approaches were suggested are shown in Table 8. The numeric values provided with the methods are for identification purposes only. Therefore, the data is nominal; there are no ordered relationships among the various listed methods.

TABLE 8
SUGGESTED TEACHING/TRAINING CONSTRUCTS

1. On-the-Job Training (OJT)	Individual Approach. Individual is taught by member's training supervisor and/or peers.
2. Seminars (SEM)	Group Approach. IMs are assembled together in a single location. May be lecture or participative format.
3. Unit Expert (EXP)	One-to-one or one-to-many Approach. Recognized expert is called upon to teach a specific topic. Shared by unit/base as a teaching resource.
4. Video Cassettes (VCR)	Technological Approach. Procure or create VCR tapes which teach/train IMs on a selected topic.
5. Off-Duty Education (ODE)	Personal Responsibility. Selection of the ODE approach indicates that costs incurred for the training area should be paid by the individual.
6. Temporary Duty (TDY)	TDY Required. The subject matter requires concentrated study and expertise which is not available at the IMs present location. Could require the establishment of AFIT PCE courses for IMs.
7. Entry-Level Requirement (ENT)	Mandatory Job Prerequisites. Prior to job assignment, or possibly, career field entry, members must complete a designated level of education/training e.g. 16 semester hours IRM courses, IRM undergraduate degree, etc.
8. Documen-tation (DOC)	Text-based. Individual learns from paper or electronic text. Examples include training manuals, letters and electronic mail.
9. Computer-Aided Instruction (COM)	Technological Approach. Procure or create computer based instruction which teaches selected topics.
10. Respondent Suggested	Respondents were asked to provide alternate methods/approaches if they desired.

Criterion-Related Validity. One source noted that criterion-related validity refers to the, "...success of a measure used for some empirical estimating purpose" (25:95). In other words, do the criteria used provide measures that

can be exploited to answer the research questions. Accordingly, the criteria were constructed relative to the measurement of the IM skills and knowledge presented in the above argument for content validity. The five constructs were then paired with the following respective criteria: **No knowledge-(scale value 1)** In general, the IM concept or item would not be recognized or would not be needed. **Some knowledge-(scale value 2)** The population had second-hand knowledge of the concept/term.

For instance, Personnel Concept III (PCIII) has not been implemented at all AF bases, yet most AF IMs are aware of the project's existence. **Hands-on experience-(scale value 3)** At least one physical act utilizing the term/concept had been experienced. For example, creating a directory on a hard disk drive illustrates touching computer keys and rudimentary knowledge of an operating system. **Functional competence-(scale value 4)** The capability to effectively and efficiently use and/or teach the term/concept to other Air Force members. **Expert-(scale value 5)** A masterful ability to use, teach, and diagnostically troubleshoot issues relative to the term/concept.

Criterion-related validity is further defined in two perspectives--predictive and concurrent (25:95). Predictive validity refers to the accuracy of a forecasted outcome. Here, the graduates were asked to predict the general needs of information managers for the year 1995. The purpose of

this was to establish skill/knowledge targets for AF/IM of the future. The work of Coleman (8) and Davis (15) has expressed the need for such future-oriented IM mission planning. Logically, the graduates' prediction accuracy for 1995 needs could not be objectively evaluated by this study. However, their prediction of needs could be used as a reference for today's IM planners and were therefore investigated by this research.

Concurrent criterion validity, the actual existence of a predicted present condition, was somewhat more evidenced. Coleman's (8) research laid the groundwork for this assertion. Her findings indicated that gaps existed between AF IM officer knowledge/skills and job demands. This was supported by other sources in the literature review which included more current documentation and interviews with key AF IM leaders (15; 33; 53; 54).

It has been suggested, "...that any criterion measure must be judged in terms of four qualities: relevance, freedom from bias, reliability, and availability" (25:96). Here, a criterion is relevant if it is defined and scored in terms we define to be the proper measure of an IM's skill or knowledge (25:96). Because this research is exploratory in nature the subject matter investigated did not have previously identified constructs. In that vein, the criterion presented herein should be viewed as a somewhat simplistic, but necessary, approach at establishment of IM

skill/knowledge constructs. Again, the point is re-emphasized that the researcher's intent was to advance the IM career field needs assessment groundwork laid by Coleman (8).

Another criterion consideration, freedom from bias, indicates that each criterion was given an equal chance to score high or low on a measurement scale (25:96). Given the graduates' established working relationships mentioned above, the wide dispersal of the respondents' MAJCOMs and the graduates' operational function at primarily headquarters levels positions support the notion that topics were given equal consideration.

"Reliable criteria are stable or reproducible" (25:96). If not, the respective measurements will not effectively allow comparison over time. For this reason, the criteria selected reflect identifiable skill/knowledge behaviors: no knowledge, some knowledge, hands-on experience, functional competence, and expert performance. The operational definition of each was previously provided under the section on construct validity.

The final criterion quality is that of availability. The researcher must ask, "Is the desired information obtainable?" The fact that the data is relevant, free from bias, and reliable is of little value if it is not accessible. Accordingly, the literature review focused on establishing IRM graduates as knowledgeable, appropriate,

and available resources for the information desired by this study.

Data Analysis

Paramount to the analysis of any data is the determination of its nature (32:38). Conventionally, numerical scales may be classified as nominal, ordinal, interval, or ratio (25:360; 36:158). Nominal data is used in place of names; ordinal data is used to indicate rank order. Interval scales contain a zero value reference point and allow division of the scale into spaces of equal length, thus allowing addition and subtraction operations (36:158). Even more precise are ratio scales which allow multiplication and division operations (36:175).

Because the data collected in this research was primarily derived from the perceptions of the graduates, equal size intervals between respondent answers could not be established. However, answers to questions one and two could be ranked. Consequently, these questions were evaluated using an ordinal scale. In contrast, responses to question three provided data which could only be tested for equality of preferences. Such data is nominal in nature, and accordingly, was evaluated using frequency counts.

Descriptive Statistics

Descriptive statistics provide the researcher with tools for characterizing data sets (32:40). Typical

examples include measures of central tendency, frequency counts, and bar graphs. These management tools were used to render a general overview of the graduates' perceptions of topics of demonstrated concern to the Air Force.

Measures of Central Tendency. The literature recognizes three measures of central tendency for the characterization of frequency distributions: mode, median, and mean (47:76). Each provides an analysis of distinctly different dimensions. Use of the mode is commonly associated with analysis of nominal data. The mode can be used to identify what measurement was selected most often and provides information relative to the concentration of data (47:76). Frequency counts provide the mechanism for determining the mode.

The median is defined as, "...the middle number when the measurements are arranged in ascending (descending) order" (47:76). The median is a valuable measure in that, unlike the mean, it is generally not effected by extremely high or low values (78:18).

The last measure of central tendency is that of the mean. McClave states that, "...the mean of a set of quantitative data is equal to the sum of the measurements divided by the number of measurements contained in the data set" (47:77). Because the mean is most useful when manipulated with interval or higher scales, its use was limited in this research. However, it did provide a

distinguishing mechanism for rank ordering all topics. Without such a mechanism, prioritization of the topics would have been less discriminatory due to the large number of tie scores reflected by mode or median values.

While all three measures were computed and reported, the greatest attention was paid to the mode. The researcher's greater concern was to obtain a consensus of opinion. Consequently, the mode was most useful because it provided the most information relative to the concentration of answers. The mean and mode were considered only to the extent that they reveal additional insight concerning unusual distributions of responses.

Statistical Tests

Statistical tests are used to test differences within and among the same or several populations (32:41). Typically, the tests are conducted as a comparison of characteristics with some perceived or hypothesized model. "The hypothesis being tested is called the null hypothesis" (32:41).

Kraft states that, "A rule for basing a choice between the actions on the observed outcome is called a test of the null hypothesis" (41:62). In this research, the null hypothesis was the "status quo" assumption that answers to interview question one and two had identical probability distributions. In layman's terms, the null hypothesis was that there was no significant difference between what IMs

presently know and what they should know by 1995. In opposition to the null hypothesis is the "alternative" hypothesis. Here, the alternative hypothesis represents the contention that the probability distributions of the respondents' 1990 perceptions are significantly different from those of their perceptions about 1995. Wilcoxon's signed rank test for paired differences was selected as the most appropriate test mechanism for this evaluation.

Wilcoxon Signed Rank Test. The Wilcoxon signed rank test is a non-parametric alternative to the parametric Paired-T test, and according to one source, more powerful than the alternative "Sign test" (55:6.7). The test's two assumptions: (1) the taking of samples from two groups, and (2) the drawing of paired samples were satisfied (55:6.7). This tool's basic purpose is to evaluate whether or not two groups have the same frequency distributions (55:6.7; 47:956-959). In this research, responses to interview questions one and two provided the two groups. Group one was represented by the respondents answers to question one, " In general, what do information managers know about...," and group two was represented by question two, "In general, what should information managers know about...." Therefore, two variables were used for each topic. The first variable corresponded to respondents' answers to question one, "In general, what do information managers know about...." The second variable corresponded to their answers for question

two, "In general, what should information managers know about...." Their numeric responses respectively represented the graduates' 1990 and 1995 perceptions of information management.

All data input and calculations were completed using the "Data Entry" and "Wilcoxon Signed Rank Test" featured in Statistix (SX) software (55). A separate test was performed for each of the 37 topics and its related pair (1990/1995) of variables. Statistix (55) numerically calculates Wilcoxon values by first ranking responses by absolute value. If the difference between variable pairs was equal to or less than 0.00001, the pair was considered a tie and a mean score was assigned to both.... "The ranks are given the same signs that the original differences had. The negative and postive signed ranks are then summed separately" (55:6.8).

To illustrate, consider the case of a true null hypothesis. In that event, the frequency distributions of 1990 and 1995 responses to a single topic were identical and the frequency distribution of their differences produced positive and negative rank sum values which were equal to zero. However, if the alternate hypothesis were true, differences for both were not equal to zero and the groups were not identical. Subsequently, the smaller of the postive and negative rank sums was compared with conventionally established standards and a confidence

coefficient was produced (47:948-949; 55:6.8). It should be noted that the coefficient represented only the probability (a value between 0.00 and 1.00 with higher values generally indicating increased confidence in the alternative hypothesis) that the two populations were not identical; no estimation of the degree of difference was implied. While many researchers prefer to display their results using confidence coefficient values, a more straight-forward approach, the use of "**P-values**" is also commonly accepted (47:344). Such values are referred to as the test's **level of significance** and are derived by subtracting the confidence coefficent from 1.00 (47:360). Lower "P-values," therefore, indicate a greater likelihood that the two populations are different. While both confidence coefficient and P-value measurements equally could have expressed his findings, the author chose to report only P-values because he believed the field level personnel would be better acquainted with its interpretation. Results from all topic tests are presented in table format at Appendix E.

Chapter Summary

Chapter III provided a detailed description of the interview instrument, its development, and implementation. In summary, the following seven questions were asked of the respondents: "In general, what do information managers know about...(37 IM topics in 1990)?" "In general, what should information managers know about...(the same 37 topics in

1995)?" "What is the most practical and effective method/ approach for training/teaching the subject matter?" "Do you believe the IRM program is accomplishing its objective of assisting the transformation of IM from a relatively non-technical career field to one of higher technical orientation?" "Which of the AFIT IRM program courses have been most useful to you on your job?" "Which of the AFIT IRM program courses have been least useful to you on your job?" And finally, "Do you have any other comments that you feel might help our study?

Arguments were also presented which explain rationales for the researcher's approach, his techniques, and sources of research validity. Baroudi and Orlinikowski's (5) recommendations, presented earlier in this chapter, provided helpful guidelines in the conduct of this research. This is noted because from an AF/IM perspective, information management is a relatively unexplored field of study. Therefore, future AF IM researchers may also wish to consider their guidance.

Chapter IV presents the data collected and the statistical results. These results help answer the research questions, and ultimately, provide a basis for recommendations and conclusions.

IV. Analysis and Results

> When you're doing real research, you'll never know what it'll cost, how much time it'll take, or what you'll find. You just know that there's unexplored territory and a chance to discover what's out there. (68:86)
>
> Clifford Stoll
> The Cuckoo's Egg

This chapter is composed of three sections. First, demographic information obtained from the sample population is presented. Next, the results of the analysis procedures relative to the first three interview questions described in Chapter III are exhibited. The final section presents the graduates' responses to interview question four, which addressed their perceptions of the effectiveness of the AFIT IRM program.

Demographics

This section characterizes the demographic qualities of the respondents. Table 9 provides a summary compilation of this data and furnishes a background for the analysis below.

Participation. In total 24 AF/IM officers were eligible for the interview conducted in this research. All eligibles completed all portions of the interview.

Rank Distribution. Of the 24 eligible officers 20 were non-rated captains and four were non-rated majors. All were members of the information management, AFSC 70XX, career field.

Educational Background. Logically, 100 percent of the interviewees had completed a master's of science (MS) degree. Six of the graduates had completed an additional masters's program, most of which were primarily business-oriented. One graduate had begun doctoral study in an IRM related discipline.

Job Experience. The graduates functional experience was diverse. As a minimum, all graduates had performed duties in at least two different types of functional areas; slightly more than 60 percent had served in three separate functional areas excluding their present position. Typical of these areas were: functional IM; wing/base staff executive support IM; civil engineering; security police; aircraft and missile maintenance; Joint Service; operational missile, flying, and training organizations, etc.

Active Duty Service (ADS). The respondents' maximum and minimum amounts of active duty service time were 19 and 6 years, respectively. The greatest concentration of ADS was between six and twelve years.

AF/IM Experience. The mean for the graduates' IM experience was seven years. A comparison of ADS and IM experience indicates that nearly 80 percent of the respondents' Air Force ADS had been spent in the IM career field. Hence, the typical respondent had been in the AF nine years, served as an IM for seven, and worked in three different functional organizations.

TABLE 9
DEMOGRAPHIC SUMMARY OF RESPONDENT CHARACTERISTICS

Total Number Available in Sample Population	24
Total Number Interviewed from Sample Population	24
Rank Distribution	Captains-83% Majors-17%
Educational Backgrounds	100% At least one MS degree 25% More than one Master's Level Degree 0% Doctoral Degree
Average Number of Different Functional Organizations to which Each Graduate had been Assigned	Three. (These included: civil engineering; security police; maintenance; wing/base staff; Joint Service; missile, flying, and training organizations; etc.
Average Number of Years on AF Active Duty	Slightly under 10 years
Average Number of Years as an AF/IM	Slightly over 7 years

Interview Questions One, Two, and Three

This section contains the analysis of the first three interview questions: (1) "In general, what do information managers know about...?" (2) "In general, what should information managers know about...?" and finally (3) "What is the most practical and effective method/approach for training/teaching...?"

Two separate approaches were used to study the graduates' responses to the interview questions above. The first method utilized aggregate data and was designed to provide a "big picture" IM view. A more detailed analysis was provided by evaluating the responses by the topic

clusters introduced in Chapter III. For convenience, the cluster names are repeated: operating systems, data communications, IM standard systems, information resource management concepts, the Information Management career field, hardware, and software.

Aggregate Knowledge/Skill Analysis

Interview questions one and two summarily asked the graduates, "In general, what do/should information managers know about...[37 IM topics]?" The analysis of these questions was begun by investigating the graduates' aggregate responses. Such an examination was conducted by reviewing responses only as they related to the instrument scale; no regard was given to the topics. As an example, all interview question one responses of "no knowledge," "some knowledge," "hands-on experience," "functional competence," and "expert" were counted by respective category. Because there were 24 graduates and 37 topics queried, there were 888 (24 x 37) total responses for each interview question.

As can be seen from Figure 1 below, more than 90 percent of the responses to question one used "no knowledge" or "some knowledge" to describe what information managers presently knew (1990) about the topics studied. In contrast, question two showed that by 1995 nearly 75 percent of the responses indicated IM knowledge/skill requirements for the same topics should be at the "hands-on experience"

level or higher. Sixty-two of that seventy-five percent was located at the "hands-on experience" and "functional competence" levels.

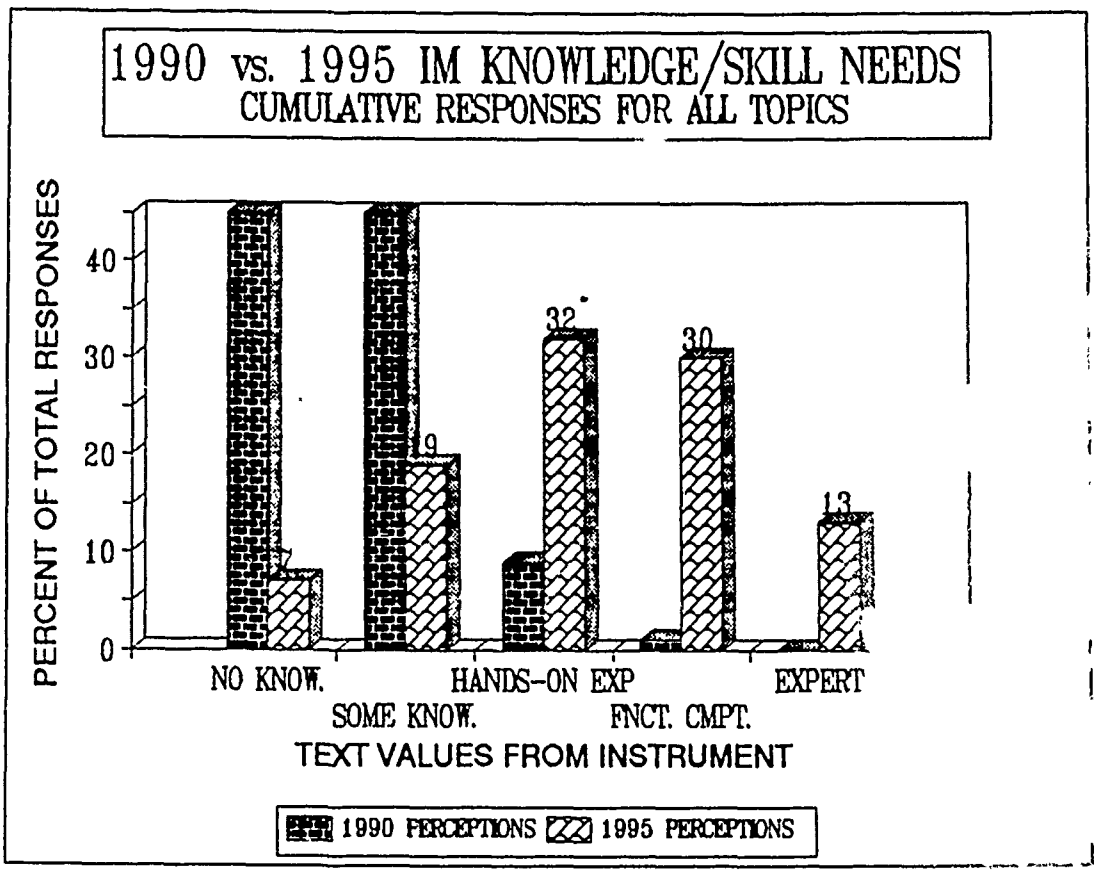


Figure 1. 1990 vs. 1995 IM Knowledge/Skill Requirements

As can be seen from Figure 1, interview question one was predominantly answered with either "no knowledge" or "some knowledge". Interview question two, on the other hand, yielded a much wider range of responses. Intuitively, this suggests that the graduates, as a whole, were less certain about their responses for the future, or that they were less consistent in their agreement, or that there was a

perceived difference in the relative importance of the various topics. For whatever reason, it cannot be denied that their perceptions for 1990 and 1995 were profoundly different.

Aggregate Training Method Analysis

Interview question three asked, "What is the most practical and effective method/approach for training/ teaching...[37 IM topics]?"

Table 8 lists the nine training methods which were suggested to the graduates plus an additional "no training" response which was suggested by a number of the graduates during the interviews. In those instances the graduates stated that no resources should be expended toward training IMs about that topic area. Three topics, Macintosh operating systems, Wang hardware, and ADA programming received consensus opinions in this response category.

The objective of question three was to determine sound training approaches for resolving perceived differences between 1990 and 1995 IM knowledge/skill requirements. As shown in Figure 2, "on-the-job training (OJT)", "seminar (SEM)", and "temporary duty (TDY)" were the most frequently recommended methods. Nearly 60 percent of the total recommendations were encompassed by these methods. In view of the fact that most topics were of a somewhat technical nature, it was interesting to note that video cassette (VCR)

and computer-aided instruction (COM) were among the least (3 percent) recommended training approaches.

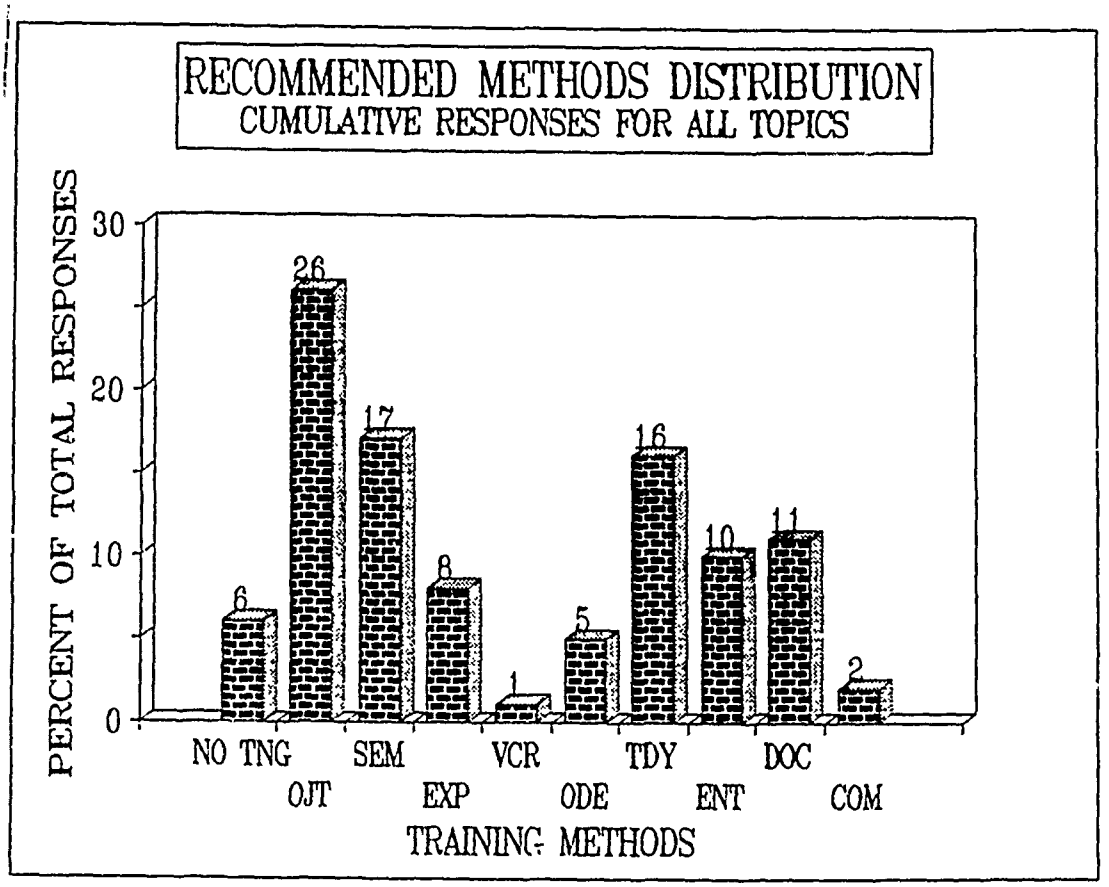


Figure 2. Recommended Methods Distribution for all Topics Studied

A comparison of the training method recommendations located in Tables 13-49 Appendix E, revealed that "on-the-job" training was the most supported method in three of the seven topic clusters. The graduates favorably recommended the use of OJT for training IMs to meet 1995 knowledge/skill requirements for Air Force Standard Systems, Data Communications, and Software clusters.

The "seminar" approach was the second most recommended training approach. Although it did not achieve a consensus of opinion for any single topic cluster, it was selected as the most popular choice for six of the thirty-seven topics. This may at first appear to be a rather insignificant issue. However, it should be recognized that only two other methods, OJT, and TDY were recommended more often. This occurrence may signal the possibility that the "seminar" method is well suited for use with a number of topics.

The most well matched training method and topic cluster combination was that of temporary duty and information resource management. In seven of the IRM cluster's eight topics, the graduates recommended TDY most often. It is of interest to note that no other topic cluster generated more narrative comment. from the graduates than IRM. Those comments will be included in the analysis of individual topic clusters presented later in this chapter.

A review of the aggregate analysis surfaced two major points. First, the graduates perceived that currently information managers in general, had little knowledge or skill associated with the topics studied. They perceived significantly higher knowledge/skill levels would be needed by IMs in the future. Secondly, the graduates supported OJT, seminar, and TDY more often than any other training method.

A more detailed evaluation of these assertions is presented in the topic cluster analysis below. However, before continuing, an explanation of the topic tables located in Appendix E is warranted.

Topic Tables. Appendix E contains 37 tables which summarize the analysis of each topic studied by this research. The tables portray the data which evolved as a result of executing the research methodology prescribed by Chapter III. To increase the utility of the tables for the reader, additional explanation of the tables is included here. Table 10, shown below, provides an example.

Tables within Appendix E were composed of two parts. The upper portion of the tables displays the mode, median, and mean responses for each topic, while the lower portion records recommended knowledge/skill teaching methods. Numbers following the methods indicate the actual frequency of choice and percent total of all graduate recommendations, e.g. OJT 4/16%.

Additionally shown, is the percent total of methods not recommended, "Other Methods." A large percentage value of "Other methods," indicates a greater degree of disagreement on the methods proposed for teaching that topic. If more than one method is shown in the same table row, the frequencies of recommendations for those methods are equal and the respective percentage shown is a cumulative value.

TABLE 10
EXAMPLE: DOS OPERATING SYSTEMS--INTERVIEW RESULTS

DOS OPERATING SYSTEMS	
LIKERT SCALE RATINGS 1—2—3—4—5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
1A. DOS 1990	2.00/2.00/2.42 [0.00]
DOS 1995	4.00/4.00/3.81
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	11/46%
SEMINAR	5/21%
TDY, DOCUMENTATION, DO NOT TRAIN	6/25% OTHER METHODS: 8%

1990 and 1995 Knowledge/Skill Differences. As recalled from Chapter III, the Wilcoxon Signed Rank test was used to test for identical probability distributions between the graduates' 1990 and 1995 perceptions. The p-value resulting from this test is located in row four of each table (Appendix E) and shown in brackets, [n.n]. For simplicity, only the tests' corresponding two-tailed P-values were reported.

The results of all Wilcoxon Signed Rank Tests strongly indicated that IM topic knowledge/skill requirements for 1990 and 1995 were not identical. In 34 of the 37 topics tested, computed P-values approximated zero. The remaining

three topics (Macintosh operating systems, copiers, and Wang computer hardware) showed only trace indications of identical requirements; none exceeded a value of 0.04. Recalling that smaller values of this measurement indicate greater statistical differences between what IMs "do" and "should" know, it appeared that all knowledge/skill needs measured reflected a significant difference. The extent of 1990/1995 knowledge/skill differences by topic, as perceived by the graduates, are presented in summary Table 11 located near the end of this section.

Cluster Analysis

The primary purpose of this analysis is to assist upper level managers in identifying fundamental areas of IM skill/knowledge requirements. Recalling that the aggregate analysis indicated practically all (90 percent) responses were currently at the "no or some knowledge" levels, the emphasis here was focused on identifying the "clusters" of greatest need. The arguments which support that need were based on the data presented in Appendix E. Greater mode, median, and mean differences between 1990 and 1995 responses, indicate a greater perceived difference between current (1990) and future (1995) IM knowledge/skill requirements.

Cluster 1: Computer Operating Systems. Four computer operating systems were investigated by this research: DOS, Macintosh, UNIX, and mainframe (any). This cluster was of

particular importance to the research because it identified the platform from which many other IM computer based applications operate. Although 1995 knowledge/skill requirements for DOS and UNIX, respectively were "functional competence" and "hands-on experience", UNIX was the system of greatest increasing need based on the observed differences in mean responses between questions 1 and 2.

Cluster 2: **AF/IM Standard Systems**. Included in this cluster were PDOS, RIMS, RAMS, and PCIII. These systems are primarily directed at increasing office automation capabilities.

The graduates provided fairly consistent responses of the need for "hands-on experience" in these topics. The only exception to this assertion was RIMS, which the graduates rated at the "functional competence" level. Such a judgment is consistent with the significantly larger scope of the RIMS program. As a whole, information managers were regarded as more than one scale step away from reaching their 1995 knowledge/skill requirements in each of these areas. While it was not possible to tell how large that step is, it can be said that the graduates invariably perceived an increased need for IM Standard Systems training.

Cluster 3: Data Communications. Eight topics were included under the umbrella of the data communications cluster: local area networks; supporting hardware and

software; electronic mail; electronic forms; data fax; data communications security; and the Defense Data Network (DDN). This category is of particular importance because of the widespread and growing influence of data communications at the work center level.

Four topics (electronic forms, electronic mail, local area networks and the Defense Data Network) in this cluster were perceived as particularly important requirements. The greatest single training need for IMs in this cluster was projected in the area of electronic forms. The graduates indicated that information managers needed to perform at a "functional competence" level to meet IM's 1995 "network oriented" mission requirements. The topics of local area networks, electronic mail, and DDN were also worthy of mention primarily because of the current perceived lack of IM knowledge/skill in these areas.

Cluster 4: Information Resource Management.

Cluster four was composed of eight relatively conceptual aspects of the Information Management career field. Included in this grouping were: identifying user requirements; the concept of information as a resource; "in-house" IM consulting for the Air Force; decision support systems; establishing IM user groups/information resource centers; CDROM optical disk use; the Standard Multiuser Small Computer Requirements Contract (SMSCRC); and the 50-S contract.

As previously mentioned, the IRM cluster received the greatest amount of unsolicited narrative comments from the graduates. In general, three assertions were consistently expressed. First, a majority of the graduates commented that there was a significant lack of clearly defined scope for the IM mission. As a result, there was a great deal of duplicated effort between the Information Management (IM) and Communications (SC) community within the realm of these topics. This raised a second point which was supported and referenced by practically all graduates: there was an extraordinary need to coordinate and cooperate IM's actions with SC, yet, traditional "turf" battles between the organizations still continue to impair mission performance.

Finally, virtually all graduates commented that there was a significant lack of understanding of IRM topics concepts at all management levels. For this reason, many graduates believed that numerous and expensive IRM-oriented decisions were rarely based on sound management principles. The most striking example noted was that of three commanders who independently and concurrently purchased three different LAN systems on the same base. The problem became most pronounced when additional and expensive data communications equipment was needed to tie the systems together.

Having presented the graduates' narrative comments, further analysis of the graduates numeric responses was continued. The IRM cluster as a whole was consistently

perceived as the area of greatest IM knowledge/skill shortfall. A review of the topic modes indicated that the need for six of the cluster's eight topics was rated as either "functional competence" or "expert". "In-house consulting for the AF" and "identifying user requirements" were the only topics in the study which were rated at the "expert" level. The shortfall may be compounded by the fact that the graduates perceived that IMs, in general, currently have "no knowledge" of five of the eight topics.

Three final observations were deserving of mention relative to this cluster. First, the topic of greatest increasing IM knowledge/skill need was the development of IM's role as an accessible and credible consultant for Air Force agencies. However, the graduates also stated that, in spite of their opinions, there was a significant amount of resistance of base level agencies to accept information managers as consultants. Second, no other cluster received more agreement on a single training method: TDY. Finally, it can be said without reservation that the respondents consistently regarded this cluster as more important than all others.

Cluster 5: IM Career Field. Cluster five was composed of two topics: the IM Strategic Plan and IMNET. These topics represent issues which are unique to the IM career field. The strategic plan is an Air Force planning document which has been developed to provide information

managers with a basic philosophy and approach for meeting IM's mission requirements. IMNET is an initiative designed to create a functional data communications network which supports several IM missions.

The graduates contended that by 1995, information managers will need a "functional competence" knowledge/skill level of the strategic plan. In general, the graduates were supportive of the document. However, several respondents stated that a widespread lack of conceptual understanding of IRM issues at all levels significantly limited the present value of the plan. Although the graduates were familiar with IMNET and its acclaimed "on-line" benefits, several commented that it was too dependent on future funding to expect realistic benefits from the initiative in the near future.

Cluster 6: Hardware. This cluster was composed of four topics: small computers, copiers, Wang computers, and mainframe computers (any).

This category was most uniquely identified by the relatively small differences between its 1990 and 1995 requirements. There appeared to be two reasons for this distinction. First was the perception that IMs were already using small computers and copiers in the work centers. Several of the graduates stated that although many IM's were using small computers, few were using them for more than word processing capabilities. As a result, there was a

fairly large consensus which believed that the Z-248 computers in the field were grossly under utilized. Nevertheless, knowledge/skill demands for small computers were expected to increase from "hands-on experience" to "functional competence".

A second reason for the relatively few changes in this cluster was the comparably small role mainframe and Wang computers are expected to play in IM's future.

Cluster 7: Software. The topics covered by this category included: desktop publishing, spreadsheets, database management, wordprocessing, mainframe applications, ADA programming and graphics.

As one might expect, the traditional role of information managers prevailed as word processing was rated as the topic of greatest knowledge/skill demand ("functional competence") for this cluster. This was followed in priority by desktop publishing and database management.

Based on the preceding analyses of mainframe computers, it seemed consistent that mainframe applications software and ADA programming were among the lowest of IM knowledge/skill requirements. One graduate did strongly support ADA programming as a significant interest for information managers in the coming years. However, 23 of the respondents indicated "no knowledge" of ADA programming was envisioned for IM over the next five years.

Summary of the First Three Interview Questions

The analysis of this section has progressed from a rather broad aggregate view of graduate recommendations to a more specific view provided through the use of topic clusters. Several important arguments have been developed relative to the research objectives. First, it can be stated that with respect to the topics studied, the graduates perceived that the IM community, in general, had practically no knowledge of the topics studied. Second, they perceived significantly higher levels of knowledge/ skill would be needed to meet IM's 1995 mission requirements. Finally, OJT, seminar, and TDY were strongly supported methods for training information managers on many of the topics in which gaps between 1990 and 1995 requirements were perceived.

While the author has made every attempt to analyze and present the issues of greatest significance, inevitably some may have been overlooked. For this reason, this section concludes with a final evaluation tool that can be employed by the reader. Table 11 shows the mean differences between graduates perceptions of 1990 and 1995 knowledge/skill requirements for all 37 topics. For convenience, the descriptive change in requirements based on observed modes was also included.

Larger differences in the table indicate greater variation between present and future requirements. If

additional detail on a topic is desired, more comprehensive data can be found at Appendix E.

TABLE 11
RANKING OF TOPICS BY 1990-1995 MEAN DIFFERENCES

SCALE VALUES 1=NO KNOWLEDGE (NK) 2=SOME KNOWLEDGE (SK) 3=HANDS-ON EXPERIENCE (HE) 4=FUNCTIONAL COMPETENCE (FC) 5=EXPERT LEVEL (EL) *=TIED SCORES (SOURCE: APPENDIX E)	1990 TO 1995 MEAN CHANGE	1990 TO 1995 MODE CHANGE
1. "IN HOUSE" CONSULTING FOR THE AF	2.71	NK-->EL
2. IDENTIFYING USER REQUIREMENTS	2.58	NK-->EL
3. USE OF CDROM TECHNOLOGY	2.33	NK-->FC
4. MANAGEMENT OF ELECTRONIC FORMS	2.23	SK-->FC
5. USE OF INFORMATION AS A RESOURCE	2.21	SK--FC
6. UNIX OPERATING SYSTEMS	2.20	NK-->FC
7. IM NETWORK (IMNET)	2.08	NK-->HE
8. DECISION SUPPORT SYSTEMS	2.04	NK-->SK
9. *SMSCRC (SMALL COMPUTER CONTRACT)	2.00	SK-->FC
10. *DATABASE MANAGEMENT SOFTWARE	2.00	SK-->FC
11. *ELECTRONIC MAIL	1.96	SK-->HE
12. *PERSONNEL CONCEPT III	1.96	NK-->FC
13. *LOCAL AREA NETWORKS	1.92	NK-->HE
14. *INFO RESOURCE CNTRS/USER GRPS	1.92	SK-->FC
15. DESKTOP PUBLISHING SOFTWARE	1.83	SK-->FC
16. IM STRATEGIC PLAN	1.79	NK-->FC
17. DEFENSE DATA NETWORK	1.75	NK-->HE
18. DATA COMMUNICATIONS SOFTWARE	1.73	NK-->HE
19. DATA COMMUNICATIONS HARDWARE	1.63	NK-->HE
20. DATA COMMUNICATIONS SECURITY	1.60	NK-->HE

TABLE 11
RANKING OF TOPICS BY 1990-1995 MEAN DIFFERENCES (Cont.)

SCALE VALUES 1=NO KNOWLEDGE (NK) 2=SOME KNOWLEDGE (SK) 3=HANDS-ON EXPERIENCE (HE) 4=FUNCTIONAL COMPETENCE (FC) 5=EXPERT LEVEL (EL) *=TIED SCORES (SOURCE: APPENDIX E)	1990 TO 1995 MEAN CHANGE	1990 TO 1995 MODE CHANGE
21. SPREADSHEETS	1.46	SK-->FC
22. MICROCOMPUTERS	1.44	HE-->FC
23. GRAPHICS SOFTWARE	1.42	SK-->HE
24. RECORDS INFO MGMNT SYSTEM (RIMS)	1.40	SK-->FC
25. DOS OPERATING SYSTEMS	1.40	SK-->FC
26. MAINFRAME APPLICATIONS SOFTWARE	1.33	NK-->HE
27. 50-S CONTRACT	1.29	NK-->HE
28. REPROGRAPHIC AUTO MGMT SYS (RAMS)	1.25	SK-->HE
29. WORDPROCESSING SOFTWARE	1.17	HE-->FC
30. MAINFRAME OPERATING SYSTEMS	1.14	NK-->SK
31. MAINFRAME HARDWARE	1.08	NK-->SK
32. PUB. DISTRIBUTION OFC SYS (PDOS)	1.05	SK-->FC
33. ADA PROGRAMMING	0.96	NK-->SK
34. FACSIMILE MACHINES (FAX)	0.83	SK-->HE
35. MACINTOSH OPERATING SYSTEMS	0.63	NK-->SK
36. COPIERS	0.54	HE-->FC
37. WANG SYSTEMS	0.46	NK-->NK

Section Three--Open Ended Questions

Section three of the analysis evaluated the graduates' responses to two open-ended questions which were directed at determining the perceived effectiveness of the IRM program. The graduates' narrative responses are provided at Appendix F.

IRM Program Objective. First, the graduates were asked to comment on the following statement:

> One of the primary objectives of the AFIT Information Resource Management (IRM) graduate program is to create a core of technical expertise that assists the IM career field in transitioning from a relatively non-technical orientation to one of higher technical orientation. Do you believe the IRM program is accomplishing that objective? If yes, how? If no, why not?

Seventeen of the respondents stated that the program was accomplishing the stated objective, five said that it was not, and two were uncertain.

In general, the graduates were extremely pleased with the IRM program and their jobs. The greatest similarity among those who supported the program's effectiveness was repeated reference to their ability to intelligently converse with technical personnel on technical issues. SC and contractors were the technical groups referred to most often.

More than half the graduates stated that the IRM education had significantly improved their ability to

perform their jobs. Many considered the task of identifying user requirements as the single most important part of their job.

Of the five graduates who stated that the program was not meeting the stated objective, there were two common themes. First and foremost, the graduates stated that their training was at best underutilized and at worst--ignored. The most referenced reasons for their negative responses included: their own [low] military rank, disinterest, and lack of cooperation among superiors, widespread IRM ignorance, and low/no supporting budgets.

The second theme that emerged was that each of the five individuals were assigned to base level positions. The graduates stated that "few if any" organizations on the base really saw them as an IRM consulting resource. In spite of their dissatisfaction, several agreed that their situation is improving.

In contrast to the unfavorable views of most graduates assigned to base level, there was one exception. One individual stated that even though he had been unable to "really utilize" his IRM training in his own unit, other organizations on base had allowed him to act as a "walk around IRM consultant". The respondent stated that his aim was to use, "... a 'manual' systems theory everywhere that he could not find computers."

Most Useful IRM Courses. The graduates were asked, "Which of the AFIT IRM program courses you completed have been most useful to you on your job?"

Two general classes of courses were referred to most often in response to this question--data communications and organizational development. The graduates stated that they were consistently called upon to practice the principles taught during these courses. The respondents perceived that these courses complimented each other in an outstanding manner. They noted that there was a growing tendency to network offices and organizations which required both the technological knowledge to choose the equipment and the management skills to assist people in making the equipment work for them.

Least Useful IRM Courses. This question asked respondents, "Which of the AFIT IRM program courses you completed have been least useful to you on your job?"

Somewhat strangely, the graduates' responses expressed no consensus of least useful courses. Accounting and economics were mentioned as "less useful", however, more than half the graduates stated that there were no "least useful" courses in the IRM program. In general, they were pleased with the academic contents of the program.

There were two basic criticisms of the course work. First, several graduates believed that it did not include enough technological courses. The most frequently expressed

concern was the lack of a local area network course. (A LAN course was added to the IRM curriculum in 1989).

The second criticism was not of the courses themselves but of the high logistical orientation used to teach them. The graduates suggested that more IRM based projects and examples be used by instructors.

Additional Comments. Finally, the graduates were asked, "Do you have any other comments which you feel might help our study?"

Twenty-two graduates replied to this question. The most predominant response to this question focused on the IM mission. More than half the graduates commented that the members of the career field have no clear definition of their mission. As a result, many perceived that their jobs were significantly more difficult than necessary. Base level IRM graduates were particularly sensitive to this point. Most stated that few commanders regarded them as anything other than traditional "administrators". To a great extent, many expressed the view that this "feet and fingers" stereotype could likely be overcome by more education of commanders from a top down perspective. Several of the respondents stated that more than anything else, they needed wing and base commanders who expected IRM expertise from the graduates.

V. Summary of Findings, Recommendations, and Conclusions

> The future depends greatly on what problems we decide to work on and how well we...use technology to solve them.
>
> Russell L. Ackoff

Significance of Results

Ackoff's words express the critical importance of setting priorities. Air Force Information Management is faced with many priority questions. What is IM's mission? What is IM's future? How should IM prepare for it? What is IM's most important priority? Education and training are among the most often mentioned responses.

While much has been said and written about IM education and training, there appears to be significant disagreement about what topics and methods should be covered by the process. This research investigated only topics which were related to the realm of information resource management processes.

In her findings, Coleman stated that her, "...research was developed to provide an initial base of knowledge so that programmatic research efforts could follow" (8:77). This study was among the first to pursue that "programmatic" effort.

The literature review and the findings presented by this study supported the notion that the demand on IMs for more computer-oriented training and education is rapidly increasing. The results of this research supported the

conclusion that IMs in general presently lack the knowledge and skill needed to effectively manage the topics studied.

Perhaps of more significance is the topic content. Based on the distribution of total responses, less than 10 percent indicate that the IM population has physically or mentally used the topics and concepts presented. If the graduates' perceptions of 1995 come to fruition, the IM mission and physical office structure will be profoundly different, particularly from the enlisted member's perspective. Office automation features such as on-line publications, electronically generated forms/orders, electronic mail, and the replacement of base communications centers by the Air Force Message Service (AFMS) initiative can be expected to radically change the duties of information managers over the next five years.

These changes raise the associated issue of content validity for enlisted entry-level IM training and Skill Knowledge Tests (SKTs). In the author's opinion, this problem may likely be further magnified by the lack of training and test developers who understand basic IRM principles. Accordingly, the findings of this study raise the question, "Does IM currently have the expertise to train and test its enlisted work force for its future mission?" The relatively long lead times typically associated with these basic IM issues increase the importance of prompt management action.

Greater insight for the career field can be gained through an investigation of the findings as they related to the original research questions.

Investigative Question One. This question asked, "To what extent are USAF information managers knowledgeable of various information resource technologies and techniques?" The graduates' responses to this question strongly indicated that information managers in general were not knowledgeable of the topics studied. In fact, only 10 percent were more than vaguely familiar with the areas. Wordprocessing, copiers, and small computers were the topics in which IMs were perceived to have the greatest current knowledge. The graduates indicated that IMs in general had physically used these items in an office environment. In contrast, information managers were believed to have the least knowledge of UNIX operating systems, decision support systems, and ADA programming.

Investigative Question Two. This question asked, "To what extent should USAF information managers be knowledgeable of relevant information resource technologies and techniques?" Question two was designed as a follow-up question for the first. Responses to this question allowed a comparison of current (1990) and future (1995) needs.

More than 75 percent of the responses indicated that IM's 1995 knowledge and skill requirements would rise to a "hands-on experience (HE)" , level or higher. In this

research, the "higher" categories were defined as either "functional competence (FC)", or "expert (EXP)". "Functionally competent" individuals could utilize and teach the basic elements of a topic. The "expert" (EXP) and "functional competence" (FC) levels were differentiated by the expert's ability to masterfully and diagnostically trouble shoot problems within a topic area.

Responses to this question were more widely distributed than those of question one, however, all were higher on the instrument scale. An aggregate knowledge/skill breakdown of 1995 IM requirements is shown in Table 12.

TABLE 12
AGGREGATE DIST. OF 1995 IM KNOWLEDGE/SKILL REQUIREMENTS

7% NO KNOWLEDGE	19% SOME KNOWLEDGE	32% HANDS-ON EXPERIENCE	30% FUNCTIONAL COMPETENCE	13% EXPERT

Eleven topics were identified at the FC knowledge/skill level. Foremost among these were the conceptual aspects of IRM. The graduates perceived the areas of IM consulting; identifying user requirements; the use of CDROM technology; the management of electronic forms; the use of information as a resource; and the development of information resource centers and IM user groups as the top six education and training needs of the IM career field.

The topics for which no additional knowledge/skill training were recommended included ADA programming, fax machines, Macintosh operating systems and Wang computers.

In answer to the investigative question, it can be stated that IMs of the future are expected to have a thorough understanding of IRM technology and the supportive management principles with which to use it.

Investigative Question Three. Investigative question three asked, "What are the most practical methods for teaching/training needed skills to information managers? The purpose of this question was to identify economic, sound, and rapidly employable training methods which could be used at field level. Nine methods were suggested to the graduates as possible training approaches. In addition, the graduates were offered the opportunity to submit suggestions of their choosing. In practice, only one other option was suggested--do not train. Several of the graduates believed some of the topics were either already over-emphasized or not an IM responsibility. Macintosh operating systems, Wang computers, and ADA programming achieved a consensus opinion in this category.

As laid out in the research design, answers to investigative question three were dependent on the answers given in questions one and two. As a result, the training methods recommended were, in many cases, prescribed for specific knowledge/skill deficiencies.

In answer to the research question, there were two topic clusters which the graduates' perceived as well matched to two different training methods: "OJT" appeared to complement Air Force Standard Systems topics; and TDY was recommended as most appropriate for topics in the IRM cluster.

The methods of "OJT", "seminar", and "TDY" gained the greatest number of graduate recommendations. These approaches were most recommended for training in more than 60 (22) percent of the topics. "Video" and "computer-aided instruction" accounted for less than 3 percent of the total recommendations.

Although suggested by only one graduate, the notion of IM regional (geographical) conferences appealed to the author as worthy of mention. The graduate's position was that regional training conferences would offer opportunities for increased travel savings and greater cross talk among IMs.

Investigative Question Four. The final investigative question turned the focus of the research from the IM career field in general and looked specifically at the graduates' perceived effectiveness of the IRM program. This final question asked, "How do IRM graduates perceive the effectiveness of the AFIT IRM program?"

Without exception, all graduates expressed an overall attitude of great respect for the IRM program. They were pleased with the foundation it had given them and with the opportunity to be more than "feet and fingers" administrators.

Notwithstanding that, most of the graduates assigned to base level positions believed that much of their training was being wasted. They identified two contributing factors. First, they believed that few of the commanders and senior managers above them understood the purpose for which the graduates had been trained. Second, although the positions to which they were assigned required advanced academic degrees, they found little objective evidence to support the requirement. These graduates agreed that the program could be made more effective if the hinderance factors described above could be changed.

Responses from graduates serving at MAJCOMs and technical support centers were decidedly more positive. These graduates commented that the IRM program was exactly what they needed to get started in their jobs. Several mentioned that the IRM program gave them a firm knowledge foundation and enough education to survive the first few weeks of their present assignment. "Beyond that," they said, "it was back to the books."

Recommendations

The findings of this research indicated a significant void between what information managers do know and what they should know by 1995. In an attempt to overcome these disparities the author makes several recommendations.

First, SAF/AAD should review the results of this study for application to the objectives of the IM Strategic Plan. Subsequently, the information should be forwarded to the Director of the AF Information Management Officer and Enlisted Training Center, Keesler AFB MS, for use as a curriculum development tool. Such a tool is useful because it may assist planners in identifying future IM requirements and responses rather than current ones. This is a key point because the current method of determining IM requirements, job inventory surveys, could not reasonably be expected to include many of the topics studied by this research.

Second, SAF/AAD should commission an executive board whose charter is to determine and define the mission of information management. Issues which pertain to the board's charter should include: (1) IM's mission relationship with SC; (2) a review of the rationale which excludes the IM mission from command, control, and communications functions identified by AFR 4-1 paragraph 1a; (3) initiation of an undergraduate level IRM educational program for enlisted information managers; and (4) establishment of a permanent long range planning board.

Third, SAF/AAD should increase commanders and MAJCOM IM's awareness of the IRM program and purpose. This can be accommodated through increased publicity and personal support of the program at appropriate public forums.

Fourth, MAJCOM DCS/IMs should ensure advanced academic degree (AAD) positions are appropriately utilized and justified. Management of IM AAD (Advanced Academic Degree) positions can be improved through greater understanding of the qualifications necessary to receive the IRM degree. Faculty members of the AFIT IRM staff provide an excellent and available resource for questions in this area.

Fifth, IRM graduates should support and organize base and regional training conferences which cater to widespread IM problem areas. Many IRM graduates already maintain frequent data network contact with other graduates. Increased utilization of the network to include a discussion of common problems may serve as an agenda generator for regional conferences.

Finally, IRM graduates need to actively expand their professional relationships with non-IRM graduates and members of the SC community. While the IRM education is a valuable asset to any information manager, a wider range of views can only be expected to improve mission performance.

Future Research

This study accepted Coleman's recommendations for future research to identify specific topic areas and related training methods (8:86). The findings of this research were consistent with Coleman's (8) in that both indicated a significant gap between IM resources and requirements.

Individuals interested in follow-up research to this project might look to any one of the seven topic clusters defined by in this study. The IRM cluster, which included such topics as IM consulting, identifying user requirements, information resource centers, and the use of CDROM technology is highly recommended. The findings of this research indicated that the greatest future IM knowledge/ skill requirements would develop in this area. Possible sources of literature review materials providing additional information on these topics should include a review of AFIT theses by: H. Bass, C. Coleman, L.Cook, B.Harmon, M. Ohotnicky, and S. Scott.

Appendix A: 1989 AFIT IRM Curriculum--Class 90D

COMM	310	FUND OF WRITTEN COMM	2.0
IMGT	290	INTRO COMPUTER PROGRAMNG	2.0
MATH	314	QUANT METH OF MANAGERS	2.0
QMGT	290	INTRO AFIT COMP SYS (LS)	2.0
COMM	687	THEORY PRACTICE PROF COM	3.0
IMGT	630	CONCEPT FNDTN INFO SYS	4.0
LOGM	490	COMP PROG CONCEPTS MGRS	3.0
MATH	525	APPL STATS FOR MGRS I	3.0
MATH	525	LAB	
COMM	630	RESEARCH METHODS	2.0
IMGT	560	COMPUTER SYSTEM CONCEPTS	3.0
MATH	535	APP STATS FOR MANGRS	3.0
MATH	535	LAB	
OPER	526	QUANT DECISION MAKING	4.0
COMM	799	THESIS	1.0
IMGT	651	SYSTEMS ANALYSIS & DSGN	3.0
IMGT	657	INFO SYSTEMS TECHNOLOGY	3.0
LOGM	657	SEM NATIONAL SEC POLICY	3.0
ORSO	542	MGMT & BEHAV IN ORGS	4.0
COMM	799	THESIS	3.0
IMGT	561	APPL OF DATABASE MGT SYS	4.0
OPER	652	DECISION SUPPORT SYSTEMS	3.0
ORSC	626	ORGANIZATIONAL DEVELOP	3.0
COMM	799	THESIS	2.0
AMGT	520	MANAGERIAL ECONOMICS I	3.0
COMM	799	THESIS	3.0
IMGT	658	LOCAL AREA NETWORKS	3.0
AMGT	602	FEDERAL FINANCIAL MGMT	3.0
CMGT	523	CONTRACTING & ACQ MGT	3.0
IMGT	654	INFOR SYSTEMS POLICY	3.0
SMGT	4[illegible]	PROJECT MANAGEMENT	3.0

Appendix B: Recommendations of the ACM Committee (4)

(a) People

-ability to hear others, as well as listen to them;

-ability to describe individual and group behavior and to predict likely alternative future behavior in terms of commonly used variables of psychology and economics;

-ability to describe and predict task-oriented, time-constrained behavior in an organizational setting.

(b) Models

-ability to formulate and solve simple models of the operations research type;

-ability to recognize in context the appropriate models for situations commonly encountered.

(c) Systems

-ability to view, describe, define any situation as a system-specifying components, boundaries and so forth;

-ability to apply this "systems viewpoint" in depth to some class of organizations-manufacturing firms, government bureaus, universities, hospitals, service providers, etc.;

-ability to perform an economic analysis of proposed resource commitments (includes ability to specify need for additional information and to make a set of conditional evaluations if information is unavailable);

-ability to present in writing a summary of a project for management action (suitable to serve as a basis for decision);

-ability to present in writing a detailed description of part of a project, for use in completing or maintaining same.

(d) Computers

-knowledge of basic hardware/software components of computer systems, and their patterns of configuration;

-ability to program in a higher-level language;

-ability to program a defined problem involving data files and communications structures;

-ability to develop several logical structures for a specified problem;

-ability to develop several different implementations of a specified logical structure;

-ability to develop specifications for a major programming project, in terms of functions modules and interfaces;

-knowledge of sources for updating knowledge of technology;

-ability to develop the major alternatives (assuming current technology) in specifying an information processing system, including data files and communications structures, to the level of major system components;

-ability to make an economic analysis for selecting among alternatives above, including identifications of necessary information for making that analysis, and also to identify non-economic factors;

-ability to make "rough-cut" feasibility evaluations (in terms of economic and behavioral variables) of proposed new techniques of applications of current technology, identifying critical variables and making estimates and extrapolations;

-ability to develop specifications for the computer-based part of a major information system, with details of task management and data base management components.

(e) Organizations

-knowledge of the function of purposeful organizational structure, and of the major alternatives for that structure;

-knowledge of the functional areas of an organization- operations, finance marketing, product specification and development;

-ability to identify in an ongoing organizational situation the key issues and problems of each functional area;

-knowledge of typical roles and role behavior in each functional area;

-ability to identify possible short-term and long-term effects of a specified action on organizational goals;

-ability to identify information needs appropriate to issues and roles above;

-knowledge of how information systems are superimposed on organizational patterns, on the operational, control and planning levels;

-knowledge of techniques for gathering information;

-ability to gather information systematically within an organization, given specified information needs and/or specified information flows;

-ability to specify, given information needs and sources, several alternative sets of information transfers and processing to meet needs;

-ability to make "rough-cut" feasibility evaluations of such alternatives;

-ability to develop positive and negative impacts of a specified information system on specified parts of an organization;

-ability to develop specifications for a major information system, addressing a given organizational need, and determine the breakdown into manual and computer-based parts.

(i) Society

-ability to articulate and defend a personal position on some important issue of the impact of information technology and systems on society (important, as defined by Congressional interest, public press, semi-technical press, etc.);

-ability to develop several positive and several negative impacts of a specified information system in a specified part of society;

-ability, given such specifications of impacts to perform a "rough cut" feasibility analysis of them in terms of behavioral and economic variables.

Appendix C: Respondents' Package

FROM: AFIT/LSG (Capt Mac McGhee) 29 MAY 90
WPAFB OH 45433-6583

SUBJECT: Information Management (IM) Career Field Needs Assessment--Telephone Interview

TO:

1. Please take a few moments to look over the attached listing of current information management (IM) topics. During the period 1-15 June 1990, I will be contacting you by telephone to request a 15-20 minute interview covering these areas.

2. The purpose of the interview is twofold:

   a. Obtain your assessment of the current and future levels of knowledge and experience held/needed by information managers.

   b. Find practical methods for filling any voids between the skills of information managers and the technology needed to complete IM's mission.

3. The interview will focus on three basic questions:

   a. How much **DO** IMs know about each area?

   b. How much **SHOULD** IMs know about each area?

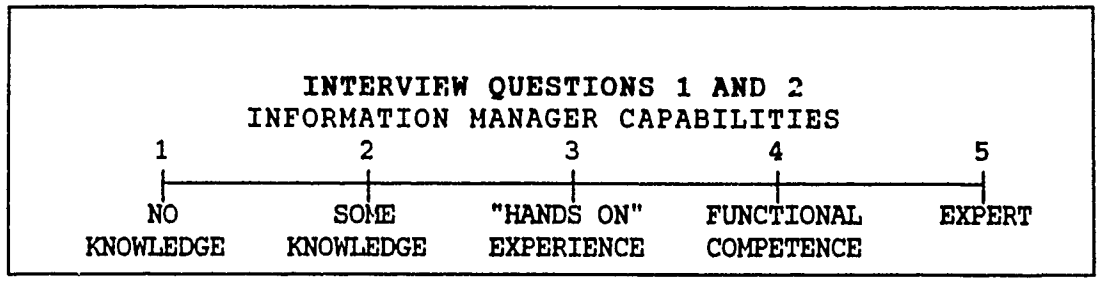
   c. What is **the most practical AND effective** way to teach/train information managers about each area.

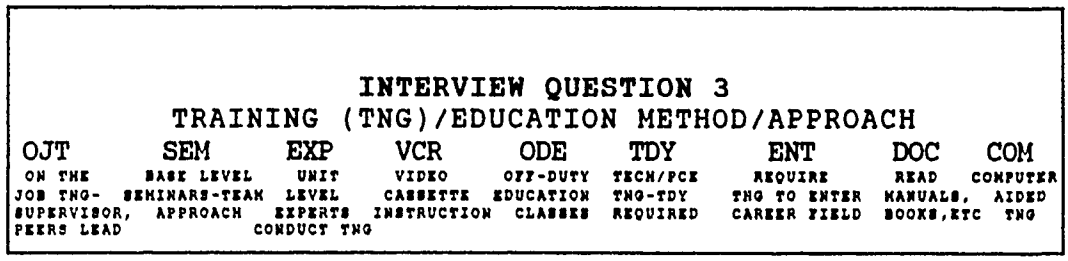
4. This interview is directed solely to AFIT information resource management graduates. Because there are currently only 24 IRM graduates serving in the IM career field, your participation is extremely important.

5. Your responses will be anonymously combined with those of other Information Resource Management (IRM) graduates to take a career field "snapshot" and record your vision of information management for the 1990s. If you have questions, please leave a message for me at AUTOVON 785-8989. I will return your call as quickly as possible.

Richard T. McGhee, Capt, USAF
Graduate Student, Information Resource Management Program, School of Systems and Logistics

Attachment
Pre-interview IM topics listing





INFORMATION MANAGERS

KNOWLEDGE/EXPERIENCE
CURRENT<----->NEEDED
(QUESTIONS 1 AND 2)

MOST PRACTICAL
TRAINING/EDUCATION
APPROACH/METHOD
(QUESTION 3)

1. **OPERATING SYSTEMS**

   A. DOS

   B. MACINTOSH

   C. UNIX

   D. MAINFRAME (any)

2. **STANDARDIZED IM SYSTEMS**

   A. PDOS--(Publications Distributed Office System)

   B. RIMS--(Records Information Management System)

   C. RAMS--(Reprographics Automated Management System)

   D. PCIII--(Personnel Concept III--IM aspects)

INTERVIEW QUESTIONS 1 AND 2
INFORMATION MANAGER CAPABILITIES

1	2	3	4	5
NO KNOWLEDGE	SOME KNOWLEDGE	"HANDS ON" EXPERIENCE	FUNCTIONAL COMPETENCE	EXPERT

INTERVIEW QUESTION 3
TRAINING (TNG)/EDUCATION METHOD/APPROACH

OJT	SEM	EXP	VCR	ODE	TDY	ENT	DOC	COM
ON THE JOB TNG-SUPERVISOR, PEERS LEAD	BASE LEVEL SEMINARS-TEAM APPROACH	UNIT LEVEL EXPERTS CONDUCT TNG	VIDEO CASSETTE INSTRUCTION	OFF-DUTY EDUCATION CLASSES	TECH/PCE TNG-TDY REQUIRED	REQUIRE TNG TO ENTER CAREER FIELD	READ MANUALS, BOOKS,ETC	COMPUTER AIDED TNG

INFORMATION MANAGERS

KNOWLEDGE/EXPERIENCE
CURRENT<---->NEEDED
(QUESTIONS 1 AND 2)

MOST PRACTICAL
TRAINING/EDUCATION
APPROACH/METHOD
(QUESTION 3)

3. **DATA COMMUNICATIONS**
   - A. Local Area Networks
   - B. Hardware
   - C. Software
   - D. Electronic Mail
   - E. Electronic Forms
   - F. Data Fax
   - G. Security
   - H. Defense Data Network

4. **INFORMATION RESOURCE MANAGEMENT**

   A. Identifying User Requirements

   B. Concept of Information as a Resource

   C. "In-house" IM Consulting for the the AF

   D. Decision Support Systems

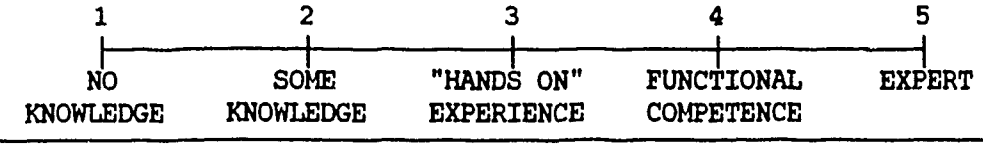
   E. Establishing IM User Groups/Information Resource Centers

   F. CD ROM Optical Disk Use

   G. SMSCRC (Standard Multiuser Small Computer Requirements Contract)

   H. 50-S CONTRACT

INTERVIEW QUESTIONS 1 AND 2
INFORMATION MANAGER CAPABILITIES



INTERVIEW QUESTION 3
TRAINING (TNG)/EDUCATION METHOD/APPROACH

OJT	SEM	EXP	VCR	ODE	TDY	ENT	DOC	COM
ON THE JOB TNG- SUPERVISOR, PEERS LEAD	BASE LEVEL SEMINARS-TEAM APPROACH	UNIT LEVEL EXPERTS CONDUCT TNG	VIDEO CASSETTE INSTRUCTION	OFF-DUTY EDUCATION CLASSES	TECH/PCE TNG-TDY REQUIRED	REQUIRE TNG TO ENTER CAREER FIELD	READ MANUALS, BOOKS,ETC	COMPUTER AIDED TNG

INFORMATION MANAGERS

KNOWLEDGE/EXPERIENCE
CURRENT<---->NEEDED
(QUESTIONS 1 AND 2)

MOST PRACTICAL
TRAINING/EDUCATION
APPROACH/METHOD
(QUESTION 3)

5. **INFORMATION MANAGEMENT CAREER FIELD**

   A. IM Strategic Plan

   B. IM NET

6. **HARDWARE**

   A. Small Computers

   B. Copiers

   C. WANG-computers

   D. Mainframe (any)

7. **SOFTWARE**

   A. Desktop Publishing

   B. Spreadsheets

   C. Database management

   D. Wordprocessing

   E. Mainframe applications

   F. ADA Programming

   G. Graphics

PART III Open-Ended Questions.

8. One of the primary objectives of the AFIT Information Resource Management (IRM) graduate program is to create a core of technical expertise that assists the IM career field in transitioning from a relatively non-technical orientation to one of higher technical orientation. Do you believe the IRM program is accomplishing that objective? (If yes, how? If no, why not?)

9. Which of the AFIT IRM program courses you completed have been most/least useful to you on your job? (Please explain.)

10. Do you have any other comments which you feel might help our study?

Appendix D: Interviewer's Guide

1. Review Standard Definitions

   a. Levels of Current and Needed Knowledge

   No Knowledge=Individual has never heard of topic.
   Some Knowledge=Individual has heard of topic, second-hand or third-hand reference permissible.
   "Hands on" Experience=Individual has at some time touched, operated, or employed the topic or concept.
   Functional Competence=Individual is qualified to use and teach the subject of discussion
   Expert=Individual is capable of teaching subject and has the ability to diagnose, trouble-shoot and solve problems in this area.

   b. Training/Education Methods
   OJT=Traditional AF training method
   SEM=Seminar Approach. Indicates that IMs are called together in a single location and a particular subject is presented to the group. It may be completed by in-house or guest lecture, participative, or unit sponsored instruction.

   EXP=Expert. A unit level or other designated subject matter expert may provide the resource for instruction. Can be used with OJT or lecture methods.

   VCR=Video Cassette Instruction. Use of VHS training tapes in a subject area. Could be standardized or unique to requirements.

   ODE=Off-Duty Education. ODE is reserved as an option for individuals who desire to learn about topics which would be helpful in the career field, but do not warrant the expenditure of AF resources for mission accomplishment.

TDY=TDY methods indicate that the subject matter generally requires concentrated and detailed study that is not available or plausible at the unit level. Typical examples include Professional Career Development Courses, specialized technical training, and attendance to professional conferences.

ENT=Entry level requirement. Utilization of this method indicates that the individual must complete designated training prior to assignment to an operational location. A typical example would include such requirements as stipulating that IM officers must complete X hours of IRM training prior to career field entry.

DOC=Documentation. May take the form of books, letters, bulletins, any written format. The concept of training/educating through documentation indicates that the learning process is aided through reading.

COM=Computer Aided Instruction. This method refers to any interactive user-computer tutorials. A typical example would be a DOS tutorial.

OTHER=Any method not listed but preferred could be added.

-Designated officer and enlisted knowledge/ experience levels did not necessarily indicate that exactly the same knowledge or experience components were identical. Unique to the position referred

c. Generic instructions

-Although much of the interview was highly structured, narrative comments would be included. The process was more than a survey.

-In general, MPC treats IMs like an IM is an IM, is an IM. Because there are exceptions to all broad generalizations, answer the questions as if you could take all officer and enlisted IMs and boil your response down to what level of knowledge/experience is possessed/needed by most IMs.

-Ask three questions:

1) What do IMs, in general, know about a given subject?
2) What should IMs, in general, know about a given subject?
3) What method do they believe is most practical for removing void?

-Limit the scope of needed knowledge/experience to the next five years

d. Ask for questions about any unclear area

e. Conduct interview

f. Thank individual for their time

Appendix E: Topic Cluster Tables

TABLE 13
CLUSTER 1, DOS OPERATING SYSTEMS--INTERVIEW RESULTS

DOS OPERATING SYSTEMS		
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL		
	RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
1A	DOS 1990	2.00/2.00/2.42 [0.00]
	DOS 1995	4.00/4.00/3.81
	MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT		11/46%
SEMINAR		5/21%
TDY, DOCUMENTATION, DO NOT TRAIN		6/25% OTHER METHODS: 8%

TABLE 14
CLUSTER 1, MACINTOSH OPERATING SYSTEM--INTERVIEW RESULTS

MACINTOSH OPERATING SYSTEMS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
1B. MACINTOSH 1990	1.00/1.00/1.25 [0.01]
MACINTOSH 1995	2.00/2.00/1.88
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
DO NOT TRAIN	7/29%
OJT	6/25%
DOCUMENTATION	4/17% OTHER METHODS: 29%

TABLE 15
CLUSTER 1, UNIX OPERATING SYSTEM--INTERVIEW RESULTS

UNIX OPERATING SYSTEMS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
1C. UNIX 1990	1.00/1.00/1.17 [0.00]
UNIX 1995	3.50/3.00/3.38
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
SEMINAR	7/29%
TDY	4/17%
EXP, ODE	3/13% OTHER METHODS: 41%

TABLE 16
CLUSTER 1, MAINFRAME OPERATING SYSTEMS--INTERVIEW RESULTS

MAINFRAME OPERATING SYSTEMS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [*P*-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
1D. MAINFRAME 1990	1.00/1.00/1.19 [0.0]
MAINFRAME 1995	2.00/2.00/2.33
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	5/21%
ODE	5/21%
DO NOT TRAIN	4/17% OTHER METHODS: 41%

TABLE 17
CLUSTER 2, PDOS--INTERVIEW RESULTS

AF IM STANDARD SYSTEMS: PUBLICATIONS DISTRIBUTION OFFICE SYSTEM	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
2A. PDOS 1990	2.00/2.00/2.06 [0.0]
PDOS 1995	3.50/3.00/3.10
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	11/46%
SEMINAR	5/21%
EXP	4/17% OTHER METHODS: 16%

TABLE 18
CLUSTER 2, RIMS--INTERVIEW RESULTS

AF/IM STANDARD SYSTEMS: RIMS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
2B. RIMS 1990	2.00/2.00/2.06 [0.0]
RIMS 1995	4.00/4.00/3.46
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
OJT	12/50%
SEMINAR, VCR	4/17% OTHER METHODS: 33%

TABLE 19
CLUSTER 2, RAMS--INTERVIEW RESULTS

AF/IM STANDARD SYSTEMS: RAMS	
LIKERT SCALE RATINGS 1—2—3—4—5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [COMPARED P-VALUE WILCOXON SIGNED RANK TEST]**
2D. RAMS 1990	2.00/2.00/1.88 [0.0]
RAMS 1995	3.00/3.00/3.13
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
OJT	14/58%
SEM, EXP, ENT	3/13% OTHER METHODS: 29%

TABLE 20
CLUSTER 2, PCIII--INTERVIEW RESULTS

AF/IM STANDARD SYSTEMS: PERSONNEL CONCEPT III	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE WILCOXON SIGNED RANK TEST COMPARISON]
2D. PCIII 1990	1.00/1.00/1.50 [0.0]
PCIII 1995	4.00/3.50/3.46
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	9/38%
SEMINAR	6/25%
EXP, ENT	4/17% OTHER METHODS: 20%

TABLE 21
CLUSTER 3, LANS--INTERVIEW RESULTS

DATA COMMUNICATIONS: LOCAL AREA NETWORKS	
LIKERT SCALE RATINGS 1 — 2 — 3 — 4 — 5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
3A. LOCAL AREA NETWORKS 1990	1.00/1.00/1.38 [0.0]
LOCAL AREA NETWORKS 1995	3.00/3.00/3.29
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
TDY	8/33%
SEM, ODE	8/33%
OJT	3/13% OTHER METHODS: 21%

TABLE 22
CLUSTER 3, HARDWARE--INTERVIEW RESULTS

AF/IM DATA COMMUNICATIONS: HARDWARE	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
3B. HARDWARE 1990	2.00/2.00/1.63 [0.0]
HARDWARE 1995	3.00/3.00/3.25
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
OJT, TDY	12/50%
DOCUMENTATION	5/21% OTHER METHODS: 29%

TABLE 23
CLUSTER 3, SOFTWARE--INTERVIEW RESULTS

AF/IM DATA COMMUNICATIONS: SOFTWARE	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH	AN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
3C. SOFTWARE 1990	1.00/1.00/1.58 [0.0]
SOFTWARE 1995	3.00/3.00/3.31
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	7/29%
SEMINAR	6/25%
TDY	5/21% OTHER METHODS: 25%

TABLE 24
CLUSTER 3, E-MAIL--INTERVIEW RESULTS

AF/IM DATA COMMUNICATIONS: ELECTRONIC MAIL	
LIKERT SCALE RATINGS 1 — 2 — 3 — 4 — 5 NO KNOWLEDGE — SOME KNOWLEDGE — HANDS-ON EXPERIENCE — FUNCTIONAL COMPETENCE — EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
3D. ELECTRONIC MAIL 1990	2.00/2.00/1.79 [0.0]
ELECTRONIC MAIL 1995	3.00/3.50/3.75
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	10/42%
SEM, TDY	6/25% OTHER METHODS: 33%

TABLE 25
CLUSTER 3, E-FORMS--INTERVIEW RESULTS

AF/IM DATA COMMUNICATIONS: ELECTRONIC FORMS	
LIKERT SCALE RATINGS 1—2—3—4—5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
3E. ELECTRONIC FORMS 1990	2.00/2.00/1.58 [0.0]
ELECTRONIC FORMS 1995	4.00/4.00/3.81
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	8/33%
SEM, TDY	8/33% OTHER METHODS: 34%

TABLE 26
CLUSTER 3, FAX--INTERVIEW RESULTS

AF/IM DATA COMMUNICATIONS: FACIMILIE MACHINES	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
3F. DATA FAX 1990	2.00/2.00/2.29 [0.0]
DATA FAX 1995	3.00/3.00/3.13
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	15/63%
DOCUMENTATION	3/13%
TDY, ENT	4/17% OTHER METHODS: 7%

TABLE 27
CLUSTER 3, SECURITY--INTERVIEW RESULTS

AF/IM DATA COMMUNICATIONS: SECURITY	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
3G. SECURITY 1990	1.50/2.00/1.65 [0.0]
SECURITY 1995	3.00/3.00/3.25
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
SEMINAR	7/29%
OJT	6/25%
DOCUMENTATION	4/17% OTHER METHODS: 29%

TABLE 28
CLUSTER 3, DDN--INTERVIEW RESULTS

AF/IM DATA COMMUNICATIONS: DEFENSE DATA NETWORK	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
3H. DEFENSE DATA NETWORK 1990	1.00/1.00/1.38 [0.0]
DEFENSE DATA NETWORK 1995	3.00/3.00/3.13
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	8/33%
SEMINAR	6/25%
EXP	3/13% OTHER METHODS:29%

TABLE 29
CLUSTER 4, USER REQUIREMENTS--INTERVIEW RESULTS

AF/IM IRM CONCEPTS: IDENTIFYING USER REQUIREMENTS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
4A. IDENTIFYING USER REQUIREMENTS 1990	1.00/1.00/1.42 [0.0]
IDENTIFYING USER REQUIREMENTS 1995	5.00/4.00/4.00
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
TDY	7/29%
ENT	6/25%
SEM, ODE	8/33% OTHER METHODS:13%

TABLE 30
CLUSTER 4, INFORMATION AS A RESOURCE--INTERVIEW RESULTS

AF/IM IRM CONCEPTS: INFORMATION AS A RESOURCE	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [COMPARED P-VALUE WILCOXON SIGNED RANK TEST]**
4B. CONCEPT OF INFORMATION AS A RESOURCE 1990	2.00/2.00/1.83 [0.0]
CONCEPT OF INFORMATION AS A RESOURCE 1995	4.00/4.00/4.04
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
TDY, ENT	12/50%
OJT, SEM	3/13% OTHER METHODS: 37%

TABLE 31
CLUSTER 4, IM CONSULTING--INTERVIEW RESULTS

AF/IRM CONCEPTS: "IN HOUSE" IM CONSULTING	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
4C. "IN-HOUSE" IM CONSULTING FOR THE AF 1990	1.00/1.00/1.33 [0.0]
"IN-HOUSE" IM CONSULTING FOR THE AF 1995	5.00/4.00/4.04
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
TDY	8/33%
ENT	5/21%
SEMINAR	4/17% OTHER METHODS:29%

TABLE 32
CLUSTER 4, DSS INTERVIEW RESULTS

AF/IM IRM CONCEPTS: DECISION SUPPORT SYSTEMS	
LIKERT SCALE RATINGS 1—2—3—4—5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
4D. DECISION SUPPORT SYSTEMS 1990	1.00/1.00/1.04 [0.0]
DECISION SUPPORT SYSTEMS 1995	2.00/3.00/3.08
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
TDY	7/29%
ODE	6/25%
SEM, EXP, ENT, DOC	8/33% OTHER METHODS:13%

TABLE 33
CLUSTER 4, IM CENTERS--INTERVIEW RESULTS

AF/IM IRM CONCEPTS: USER GROUPS AND CENTERS	
LIKERT SCALE RATINGS 1—2—3—4—5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
4E. ESTABLISH IM USER GROUPS AND INFORMATION RESOURCE CNTRS 1990	2.00/2.00/1.67 [0.0]
ESTABLISH IM USER GROUPS AND INFORMATION RESOURCE CNTRS 1995	4.00/4.00/3.58
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
TDY	9/38%
SEMINAR	8/33%
OJT	4/17% OTHER METHODS: 12%

TABLE 34
CLUSTER 4, CDROM--INTERVIEW RESULTS

AF/IM IRM CONCEPTS: COMPACT DISKS AND READ ONLY MEMORY	
LIKERT SCALE RATINGS 1——2——3——4——5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
4F. CD ROM OPTICAL DISK USE 1990	1.00/1.00/1.29 [0.0]
CD ROM OPTICAL DISK USE 1995	4.00/4.00/3.63
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
TDY, ENT	8/33%
OJT, EXP, VCR, DOC	12/50% OTHER METHODS:12%

TABLE 35
CLUSTER 4, SMSCRC--INTERVIEW RESULTS

AF/IM IRM CONCEPTS: STANDARD MULTI-USER SMALL COMPUTER REQUIREMENTS CONTRACT	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
4G. STANDARD MULTI-USER SMALL COMPUTER REQUIREMENTS CONTRACT 1990	2.00/2.00/1.58 [0.0]
STANDARD MULTI-USER SMALL COMPUTER REQUIREMENTS CONTRACT 1995	4.00/4.00/3.58
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
SEMINAR	8/33%
OJT	7/29%
TEMPORARY DUTY	4/17% OTHER METHODS: 21%

TABLE 36
CLUSTER 4, 50-S CONTRACT--INTERVIEW RESULTS

AF/IM IRM CONCEPTS: 50-S CONTRACT	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
4H. 50-S CONTRACT 1990	1.00/1.00/1.33 [0.0]
50-S CONTRACT 1995	3.00/3.00/2.63
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
OJT	6/25%
DO NOT TRAIN, SEMINAR	10/42% OTHER METHODS: 33%

TABLE 37
CLUSTER 5, STRATEGIC PLAN--INTERVIEW RESULTS

IM CAREER FIELD: 1990 STRATEGIC PLAN	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXONSIGNED RANK TEST COMPARISON]
5A.IM STRATEGIC PLAN 1990	1.00/1.00/1.58 [0.0]
IM STRATEGIC PLAN 1995	4.00/4.00/3.75
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
DOCUMENTATION	10/42%
OJT	5/21%
SEMINAR, EXPERT	6/25% OTHER METHODS: 12%

TABLE 38
CLUSTER 5, IM-NET--INTERVIEW RESULTS

IM CAREER FIELD: IM-NET	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
5B. IM NET 1990	1.00/1.00/1.33 [0.0]
IM NET 1995	3.00/3.00/3.41
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
SEMINAR, TEMPORARY DUTY	12/50%
DOCUMENTATION	5/21% OTHER METHODS: 29%

TABLE 39
CLUSTER 6, SMALL COMPUTERS--INTERVIEW RESULTS

AF/IM HARDWARE: SMALL COMPUTERS	
LIKERT SCALE RATINGS 1—2—3—4—5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
6A. SMALL COMPUTERS 1990	3.00/3.00/2.54 [0.0]
SMALL COMPUTERS 1995	4.00/4.00/3.98
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
ENTRY LEVEL REQUIREMENT	9/38%
OJT	7/29%
TEMPORARY DUTY	3/13% OTHER METHODS:20%

TABLE 40
CLUSTER 6, COPIERS--INTERVIEW VIEW RESULTS

AF/IM HARDWARE: COPIERS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
6B. COPIERS 1990	2.00/3.00/2.83 [.03]
COPIERS 1995	4.00/4.00/3.38
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
OJT	12/50%
ENTRY LEVEL REQUIREMENT	3/13%
SEMINAR, EXPERT, TEMPORARY DUTY, DOCUMENTATION	8/33% OTHER METHODS:4%

TABLE 41
CLUSTER 6, WANG COMPUTERS--INTERVIEW RESULTS

AF/IM HARDWARE: WANG COMPUTER SYSTEMS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
6C. WANG COMPUTERS 1990	1.00/1.00/1.17 [.04]
WANG COMPUTERS 1995	1.00/1.00/1.63
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
DO NOT TRAIN	9/38%
OJT	5/21%
EXPERT, DOCUMENTATION	6/25% OTHER METHODS: 16%

TABLE 42
CLUSTER 6, MAINFRAME--INTERVIEW RESULTS

AF/IM HARDWARE: MAINFRAME COMPUTERS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
6D. MAINFRAMES 1990	1.00/1.00/1.38 [0.0]
MAINFRAMES 1995	2.00/2.00/2.46
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
OJT, SEMINAR, DOCUMENTATION	15/63% OTHER METHODS: 37%

TABLE 43
CLUSTER 7, DESKTOP PUBLISHING--INTERVIEW RESULTS

AF/IM SOFTWARE: DESKTOP PUBLISHING	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
7A. DESKTOP PUBLISHING 1990	2.00/2.00/1.79 [0.0]
DESKTOP PUBLISHING	4.00/4.00/3.63
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
SEMINARINAR	9/38%
OJT	6/25%
TEMPORARY DUTY, ENTRY LEVEL REQUIREMENT, DOCUMENTATION, COMPUTER AIDED TRAINING	8/33% OTHER METHODS: 4%

TABLE 44
CLUSTER 7, SPREADSHEETS--INTERVIEW RESULTS

AF/IM SOFTWARE	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE WILCOXON SIGNED RANK TEST COMPARISON]
7B. SPREADSHEETS 1990	2.00/2.00/1.92 [0.0]
SPREADSHEETS 1995	3.50/3.00/3.38
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	8/33%
SEMINAR, EXPERT, DOCUMENTATION	3/13% OTHER METHODS:54%

TABLE 45
CLUSTER 7, DATABASE MANAGMENT--INTERVIEW RESULTS

AF/IM SOFTWARE: DATABASE MANAGEMENT	
LIKERT SCALE RATINGS 1——2——3——4——5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
7C. DATABASE MANAGEMENT 1990	2.00/2.00/1.75 [0.0]
DATABASE MANAGEMENT 1995	3.50/4.00/3.75
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	6/25%
TEMPORARY DUTY	5/21%
SEMINAR, DOCUMENTATION	4/17% OTHER METHODS:37%

TABLE 46
CLUSTER 7, WORDPROCESSING--INTERVIEW RESULTS

AF/IM SOFTWARE: WORDPROCESSING	
LIKERT SCALE RATINGS 1——2——3——4——5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
7D. WORDPROCESSING 1990	3.00/3.00/3.04 [0.0]
WORDPROCESSING 1995	4.00/4.00/4.21
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
OJT	5/21%
SEMINAR, TEMPORARY DUTY	4/17% OTHER METHODS:62%

TABLE 47
CLUSTER 7, MAINFRAME APPLICATIONS--INTERVIEW RESULTS

AF/IM SOFTWARE: MAINFRAME APPLICATIONS	
LIKERT SCALE RATINGS 1—2—3—4—5 NO KNOWLEDGE / SOME KNOWLEDGE / HANDS-ON EXPERIENCE / FUNCTIONAL COMPETENCE / EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
7E. MAINFRAME APPLICATIONS 1990	1.00/1.00/1.21 [0.0]
MAINFRAME APPLICATIONS 1995	3.00/2.50/2.54
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
TEMPORARY DUTY	6/25%
DO NOT TRAIN, OJT	10/42% OTHER METHODS: 33%

TABLE 48
CLUSTER 7, ADA PROGRAMMING--INTERVIEW RESULTS

AF/IM SOFTWARE: ADA PRGRAMMING	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]
7F. ADA PROGRAMMING 1990	1.00/1.00/1.04 [0.0]
ADA PROGRAMMING 1995	2.00/2.00/2.00
MOST RECOMMENDED TRAINING METHODS	FREQUENCY/PERCENT TOTAL RECOMMENDATIONS
DO NOT TRAIN	9/38%
TEMPORARY DUTY	7/29%
DOCUMENTATION	3/13% OTHER METHODS: 20%

TABLE 49
CLUSTER 7, GRAPHICS--INTERVIEW RESULTS

AF/IM SOFTWARE: GRAPHICS	
LIKERT SCALE RATINGS 1 NO KNOWLEDGE — 2 SOME KNOWLEDGE — 3 HANDS-ON EXPERIENCE — 4 FUNCTIONAL COMPETENCE — 5 EXPERT LEVEL	
RESEARCH TOPIC	**MODE/MEDIAN/MEAN [P-VALUE FROM WILCOXON SIGNED RANK TEST COMPARISON]**
7G. GRAPHICS 1990	2.00/2.00/2.04 [0.0]
GRAPHICS 1995	3.00/3.00/3.45
MOST RECOMMENDED TRAINING METHODS	**FREQUENCY/PERCENT TOTAL RECOMMENDATIONS**
OJT	12/50%
EXPERT, TEMPORARY DUTY, ENTRY LEVEL REQUIREMENT	9/38% OTHER METHODS: 12%

Appendix F: Respondents Comments to Open-ended Questions

Part III: Interview Question 8

One of the primary objectives of the AFIT Information Resource Management (IRM) graduate program is to create a core of technical expertise that assists the IM career field in transitioning from a relatively non-technical orientation to one of higher technical orientation. Do you believe the IRM program is accomplishing that objective? (If yes, how? If no, why not?)

1. Yes, it is helping us to learn to how to deal with the electronic environment.

2. No, I don't agree. We're not putting our management skills to use.

3. Yes, but what we do shouldn't be confused with the "techees". We are here to help interface the gap between systems, builders, and users.

4. Yes, what we're doing is important. It gives us a broad base of understanding, but we need more technical instruction.

5. Yes, we were exposed to the technical elements and it is helping.

6. Yes. More education is needed at higher levels. There is a lot of "forward-thinking" shown by the grads. We need to get more Air Staff direction about our jobs.

7. Yes, more benefits are being seen at base level.

8. Not really. We're not fully used, there's no budget, and the base is closing. I'm a member of the CSRB, but I feel like I'm just sitting here forgetting everything I learned.

9. Yes, but I'm not getting any support to do anything. I can't effect program changes. I'm regarded as too young and I'm burned out on the other stuff I have to do.

10. Yes, 110%. I'm using a manual systems approach. We don't have the money to buy new equipment, so I am farming myself out where ever I can. I feel like I have been able to help in defining user requirements.

11. Yes! I'm on the SAG advisory to advise the DESTINY folks on revisions of the Strategic Plan. Its mainly me and several other grads.

12. Yes, the variety of courses was good. Exposed us to business principles that I would not have known. You have to do your homework, but now I feel like I can identify user applications [of software] when I walk in the door.

13. Yes, it allows me to talk to the "techees". I can explain what we do and understand what they do.

14. No, the course work was not technical enough. The program needs a greater focus on software and hardware.

15. Yes, but the follow on assignment needs to be closely matched to the program. More technical courses would have helped--needed a LAN course.

16. No, not enough technical background. We're not viewed as IRM experts, we're looked at as computer experts. I've ruined three pair of panty hose installing LAN cable.

17. Yes, I can talk with the SC guys, but they're not looking at IM as a consultant resource. The base has their own functional folks. It's strange, once the only guy with any knowledge about the system is recognized, the whole deal gets dumped on them. I guess it's a period of struggle, trial, and error. My biggest problem is that I'm only a captain. I guess we're making little in-roads, one at a time.

18. Yes, it does give us a more technical orientation. But, we really need to take a look at where we're sending our graduates--it would only yield a better payback to the AF.

19. No, too hard for captains to convince leadership of what we're all about. The boss says, "We're not going LAN." People outside the career field don't want to look ahead.

20. Yes, we're moving the career field from nontechnical to more technical orientation.

21. Yes, the program prepared me better than I had dreamed. However, its not a "tech" program. To get the best from the program we need to move toward a partnership with SC. We need to put the turf battles and personality issues behind us.

22. Not really sure. Mainly it needs more technical orientation.

23. Yes, I feel like the "bridge person". Its helpful, but we need to be more sure that we're putting folks in jobs where they'll be used. My boss was "uninterested". My biggest problem is that my rank was not appropriate [high enough] to do my job.

24. Hard to tell. We're in a transition time. There are a lot of roadblocks to getting our skills utilized. The AF spent a lot to educate me and it's not being realized.

Interview Question 9: Most Useful Courses

Which of the AFIT IRM program courses you completed have been most/least useful to you on your job? (Please explain.)

1. They were all good.
2. Thesis helped most.
3. Decision Support Systems from Valusek and Federal Financial Management (FFM)
4. All of Jennings' courses and organizational behavior were useful.
5. Data Communications, Database, Federal Financial Management, and Organizational Development with Jennings were the best.
6. Data Communications were the most important, very specific to my job.
7. Everyone was good, but I guess Data Communications and McBride's IMGT intro course.
8. Data Communications, Database Management, and Systems Design were the better ones.
9. All the management courses. Really helped me understand how to get technical people to work for me.
10. McBrides's IMGT intro course, the management courses and the organization development stuff.
11. All the data communications courses, requirements analysis and consulting.
12. Peschke's MIS course, Organization Behavior, FFM and contracting.
13. The introduction to microcomputers course was really good.
14. Organization Behavior has been helpful.
15. All of the "hands-on software" courses, Database Management, and the Organizational Development course were super.

16. Database Management, Data Communications, and McBride's IMGT course.

17. All the MIS courses, Organization Development and Statistics have been helpful.

18. Data Communications and Database Management Systems were the best.

19. Decision Support Systems, Database Management, and the Data Communi' tions courses have been extremely useful.

20. Data Communications, Statistics, all the operating systems coursework, and Database. All were really good.

21. I guess Data Communications and Jennings' Organizational Development courses have been the most useful.

22. Oddly enough, Statistics, they really have helped me understand some ADP principals.

23. All the IRM core courses and the FFM course.

24. All the systems courses were helpful. Data Communications has made it really easy to understand what the SC people were saying. Even Quantitative Decision Methods (QDM) has been useful.

Interview Question 9: Least Useful Courses

1. The Systems Acquisitions course was not very helpful because it was so logistically oriented. We needed more emphasis on IRM topics.

2. All were good, but we need more technical detail, especially more on various operating systems.

3. They were all useful.

4. Accounting and economics were wastes.

5. Accounting and economics have not proved terribly useful.

6. Economics and FFM.

7. There was too much overlap in the organizational management courses, but all were good.

8. Accounting and QDM.

9. The war courses.

10. The math courses.

11. FFM

12. Don't change anything, they were all useful.

13. They were all useful, but we need more software applications courses.

14. Accounting and Economics haven't been too helpful.

15. Accounting was worthless.

16. All the courses were great. Don't change anything.

17. Business oriented and management courses .

18. Accounting courses need to be removed.

19. Accounting and FFM haven't been helpful on my job, but they have help me in other areas.

20. The LOGM 490 and COMM courses were not anything special.

21. Statistics haven't proved too useful.

22. None of the courses were least useful. All were good.

23. None. They were all good.

24. Statistics and the non-core courses need to be replaced.

Other Comments:

Finally, the graduates were asked, "Do you have any other comments which you feel might help our study?"

1. We need to redefine the career field. Even our own people don't understand the name change. We're not taken seriously.

2. Once you teach a slave to read, he'll never be satisfied as a slave. Too many folks think we need to still be slaves. I feel like a slave who has learned to read.

3. We need to make some intense training improvements fast. Otherwise, we'll lose IM's credibility as a whole because too many IM's are tasked with jobs they haven't been trained to do. Credibility is everything. SC guys here have been great to work with.

4. There is a rea need for a comprehensive training effort. The IM's in the field have no idea of the changes that are going on.

5. Training is a prime concern. Base level IMs really need help. We need a clear definition of SC's and IM's roles.

6. We really need some strategic planning initiatives that do something...not just talk about it. It may be time to separate the career field. Too many guys are getting wasted in areas they haven't been trained for.

7. Every single page of the Data Communications book is important. OJT is a great technique for training, but we need to make sure the blind are not trying to lead the blind--too much is at stake. We need more IRM training at the tech school level--officers and enlisted.

8. No comment.

9. Currently, we are a career field void of leadership. We are going in too many different directions. It is too difficult to get a focus. We need to develop many small centers of excellence so that we can all move forward.

10. We need a clear career field role definition. We need a list of critical success factors from the top levels. Many of the tools are now in the users hands now we need to define our niche. The Air Staff is not showing a clear direction. We need one.

11. With LANs and PCs becoming such a big deal, we need some real "forward thinking" management direction. All the talk about TQM is useless if we don't first deal with the apathetic users, the haters of computers, and the old "fuddy-duddies".

12. We really need to overcome many of the bad training habits we have practiced for so long. The guys going to Chief of IM positions need the IRM training and bosses who will help and let them do their jobs. Do it a Keesler.

13. We need to start tailoring the education to the job. We need to utilize trained resources in the areas they are trained for. Who's minding the mission?

14. I know Colonel Nations has talked with a lot of the base commanders, but they still don't see us as useful to them. I am not being used. I don't think the wing and base commanders know what the Air Force spent its money training us for.

15. I am doing my best to "muddle through" my training to the base. Maybe they'll get the point. It's just a slow process.

16. Don't pick a thesis topic that is not related to the job. Make it applicable to the career field. I've found the biggest payoff of school to be the network of graduates and classmates.

17. Finish your thesis. IMs need more training with local area networks. We need to be able to increase the fun level and decrease the training people need to do their jobs. IMs need to make the process transparent to the users.

18. The coding of slots for IM assignments is a joke. We need to look closely at were we send grads. The codes really should be meaningful.

19. Biggest problem in the career field is that our people aren't getting trained. The basic school is baloney. Outside of AFIT, we got no real training, no PCE, no nothin'. The career field is in chaos. Where are we going and where we stand. There is a clear lack of role definition.

20. No comment.

21. AFIT needs to focus on teaching the graduates how to teach folks in the field.

22. The program has really help me, "get some respect."

23. The program is great in that it gives up the knowledge and skills to make the equipment work for the people.

24. The IMs in the field really need to hear what's going on with the career fiel

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13. ABSTRACT (Maximum 200 words)

This research investigated 37 training topics which were of interest to Air Force (AF) information managers, Air Force Specialty Code 7XXX. The topics were grouped into the following seven information resource related clusters: (1) computer operating systems, (2) data communications, (3) Air Force Standard Systems (PDOS, RAMS, RIMS, and PCIII), (4) information resource management concepts, (5) AF/IM career field issues, (6) computer hardware, and finally, (7) computer software. Twenty-four graduates of the AF Institute of Technology's (AFIT) Information Resource Management program were asked to provide their perceptions of AF information managers (IMs) current (1990) and needed (1995) knowledge/skill levels on each topic. Telephone interviews with the respondents indicated that, relative to the 37 topics discussed, the graduates perceived a significant difference between current and needed knowledge/skill levels in practically all topic areas. The respondents also provided recommendations on effective and practical training methods/approaches for closing knowledge/skill level gaps. Finally, the graduates provided feedback relative to the effectiveness of the IRM program. Keywords:

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